PRINCIPALS' E-LEADERSHIP PRACTICES, TEACHERS' COMPUTER-MEDIATED COMMUNICATION COMPETENCE, SCHOOL VIRTUAL LEARNING CULTURE AND TEACHERS' ATTITUDES TOWARD FROG VLE IN KLANG

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ABSTRACT

Malaysia Education Blueprint 2013-2025 was introduced to develop a new education vision in Malaysia's education system. In accordance with the government's vision of giving quality internet-enabled education for all, Ministry of Education Malaysia (MOE) had initiated a project known as 1BestariNet to equip all 10,000 schools in Malaysia with the Internet-based Virtual Learning Environment (Frog VLE). The usages of Frog VLE in all Malaysian schools are under tremendous pressure to improve. Principals' e-leadership, teachers' CMC competence, school virtual learning culture, and teachers' attitude toward using Frog VLE is a research avenue which must be extensively explored with the anticipation that the findings will enhance existing practices or increase the usage of Frog VLE. Specifically, this proposed study examined the relationship between secondary school principals' e-leadership practices with teachers' attitude toward using the Frog VLE in the Klang district or it is mediated by teachers' computer-mediated communication competence and school virtual learning culture. Teachers' demographic characteristics were chosen as moderating variables. This is a non-experimental research using a cross-sectional survey technique through administration of questionnaire. A total of 454 teachers from 34 daily public secondary schools in Klang district were randomly selected to participate in this study and a total of 383 subjects responded to the study with a response rate of 84.4%. Based on Krejcie & Morgan's (1970), the minimum number of respondents needed for this study at 95% confidence level is 351 teachers. Hence, 351 questionnaires randomly selected was first analyzed for descriptive statistics in term of mean and standard deviation followed by inferential statistics such as Spearman's -rho tests which help to identify the relationship between variables. Structural equation modelling (SEM) procedures with Smart PLS 2 is used to examine the mediation and moderation model proposed. Results indicated that teachers in the Klang district secondary schools showed medium level of attitude and

CMC competence toward using Frog VLE. Besides, teachers perceived that their principals demonstrated medium level of e-leadership practices and perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE. The findings confirmed that there is statistically significant positive correlation between principal e-leadership practices, teacher CMC competence, school virtual learning culture, and teacher attitude toward using Frog VLE. This study concluded that there is a full mediating effect of teacher CMC competence and partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Teacher demographic characteristics such as gender, age, computer experience and teaching experience are not the moderators. This current study has numerous implications and contributions to the body of knowledge on technology integration and pedagogical innovations. The findings of this study could be compared and contrasted with similar studies in other regions and countries and the mediation model established could be further tested and verified.

ABSTRAK

Pelan Pembangunan Pendidikan Malaysia 2013-2025 telah diperkenalkan untuk membangunkan wawasan baru dalam sistem pendidikan Malaysia. Bertepatan dengan saranan kerajaan untuk memberi pendidikan internet yang berkualiti untuk semua, Kementerian Pendidikan Malaysia (KPM) telah memperkenalkan projek 1BestariNet untuk melengkapkan semua 10,000 buah sekolah di Malaysia dengan persekitaran pembelajaran maya berasaskan Internet (Frog VLE). Semua pihak sekolah menerima tekanan dalam meningkatkan penggunaan Frog VLE. E-kepimpinan pengetua, kompetensi komputer-pengantara komunikasi (CMC) guru, budaya pembelajaran maya sekolah dan sikap guru terhadap penggunaan Frog VLE merupakan bidang penyelidikan yang perlu diterokai untuk meningkatkan amalan sedia ada dan penggunaan Frog VLE. Secara khusus, kajian ini meneliti kesan pengantaraan kompetensi komputer-pengantara komunikasi (CMC) guru dan budaya pembelajaran maya sekolah dalam hubungan antara e-kepimpinan pengetuadan sikap guru terhadap penggunaan Frog VLE. Ciri-ciri demografi guru telah dipilih sebagai pembolehubah penyerdahana. Kajian ini menggunakan reka bentuk bukan eksperimen dengan kaedah tinjauan keratan rentas melalui borang soal selidik. Seramai 454 orang guru dari 34 buah sekolah menengah kebangsaan (harian) di daerah Klang telah dipilih secara rawak untuk mengambil bahagian dalam kajian ini dan sebanyak 383 orang guru memberi maklum balas soal selidik dengan kadar respons sebanyak 84.4%. Menurut Krejcie & Morgan's (1970), bilangan minimum responden yang diperlukan untuk kajian ini pada tahap keyakinan 95% adalah 351. Oleh itu, 351 soal selidik akan dipilih secara rawak untuk penganalisisan data yang melibatkan statistik deskriptif dari segi min dan sisihan piawai dan diikuti oleh statistik inferensi seperti uji Spearman rho untuk mengenal pasti hubungan antara pembolehubah kajian ini. Pemodelan Persamaan Struktur (SEM) dengan Smart PLS 2 digunakan untuk memeriksa model pengantaraan dan

penyerdahana yang dicadangkan. Hasil kajian menunjukkan bahawa tahap sikap dan tahap kompetensi komputer-pengantara komunikasi (CMC) guru-guru di sekolah menengah daerah Klang berada di tahap sederhana. Selain itu, guru-guru berpandangan bahawa pengetua mereka pada tahap amalan e-kepimpinan yang sederhana dan melihat budaya pembelajaran maya sekolah terhadap penggunaan Frog VLE pada tahap sederhana. Dapatan kajian mengesahkan bahawa terdapat korelasi positif yang signifikan antara amalan e-kepimpinan pengetua, kompetensi komputer-pengantara komunikasi (CMC) guru, budaya pembelajaran maya sekolah, dan sikap guru terhadap penggunaan Frog VLE. Kajian ini turut menyimpulkan bahawa kompetensi komputer-pengantara komunikasi (CMC) guru memberi kesan pengantaraan penuh kepada hubungan antara amalan e-kepimpinan pengetua dan sikap guru terhadap penggunaan Frog VLE manakala budaya pembelajaran maya sekolah memberi kesan pengantaraan separa kepada hubungan antara amalan e-kepimpinan pengetua dan sikap guru terhadap penggunaan Frog VLE. Dapatan juga melaporkan bahawa ciri-ciri demografi guru iaitu jantina, umur, pengalaman dengan komputer dan pengalaman mengajar bukan pembolehubah penyerdahana. Secara keseluruhan, kajian ini memberi implikasi dan sumbangan kepada badan pengetahuan dari segi integrasi teknologi dan inovasi pedagogi. Hasil kajian ini boleh dibandingkan dengan kajian yang sama di kawasan atau negara lain dan model pengantaraan yang dicadangkan boleh diuji dan disahkan dengan lebih lanjut.

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LIST OF SYMBOLS AND ABBREVIATIONS

AIT	:	Advanced Information Technology
AVE	:	Average Variance Extracted
BI	:	Behavioural Intentions
CAM	:	Computer Attitude Measure
CMC	:	Computer-Mediated Communication
DOI	:	Diffusion of Innovation Theory
E	:	Perceived Ease of Use
EFL	:	English Foreign Language
EPRD	:	Educational Planning and Research Division
GIS	:	Geographic Information Systems
IAB	:	Institute Aminuddin Baki
ICT	:	Information and Communication Technology
ITMT	:	Information Technology Mentor Teachers
MOE	:	Ministry of Education
MSC		Multimedia Super Corridor
NPQEL	:	National Professional Qualification for Educational Leaders
SCT	:	Social Cognitive Theory
SEM	:	Structural Equation Modeling
TAM	:	Technology Acceptance Model
TPB	:	Theory of Planned Behavior
TRA	:	Theory of Reasoned Action
U	:	Perceived Usefulness
VLE	:	Virtual Learning Environment

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CHAPTER 1: INTRODUCTION

1.1 Overview

Since the mid-1990s, the idea that we live in a global knowledge economy has come at least to dominate policy talk at all scales including institutional, national, regional and global (Robertson, 2005). OECD (1996) defined knowledge economy as the role of knowledge and technology has taken on greater importance in economic growth. Governments are urges to come up with policies and approaches that promote the capacity to know how to utilize and innovate with ICT (OECD, 1996). On the other hand, schools are urges to address the issues of the global economy in this era of globalization (Spring, 2008). Dale & Robertson (2003) indicates "formal education is the most commonly found institution and most commonly shared experience of all in the contemporary world" (p.7). In addition, Hussien (2013) said that education is a valuable social commodity that can transform human capital to another stage of development. Therefore, education institutions have to face the ramifications of globalization and worldwide educators and trainers are confronted with a demand for greater adaptability, openness, accessibility and quality (Colin & Donald, 2003).

With regard to educational debate, educational agendas such as investing in education to promote economic growth and to develop human capital had been discussed by most of the world's governments (Spring, 2008). One of the reasons is because educational attainment has been seen as one of the indicators to compare the country's economic potential (Haughey, 2006). Therefore, we can see that school play a very important role and must carry the burden of both optimizing student learning and prepare today's youth for a technologically advanced workplace of the future (Leonard & Leonard, 2006). The school must be responsive to community requirement and

expectation of changes (Simpson, Payne, & Condie, 2005). So, school is expected to prepare their students to remain competitive in this rapidly changing global economy. In the year 2011, Castells deciphers the idea of global flows into networks. He mentioned that communication becomes instantaneous because of the Internet that are able to compress time and space. He added that the ability of the network to expand is boundless and being in a network increases the potential of success in most endeavors including in the field of education.

As we know, education and the Internet are explicitly linked to innovation, global economic development and social development (Robertson, 2005). Greater connectivity and technological advancement have enriched and expanded education for us (Siti Faizzatul Aqmal, Razali, & Ahmad Fadzil, 2014). The Internet era that we have entered is a current force of change that is connecting more and more things to the network including in the field of education. Undeniable, skills and knowledge in using technology tools is becoming increasingly important in our educational system in this era of globlalization (Adeyemi & Olaleye, 2010). It is important to utilize Information and Communication Technology (ICT) to teach the knowledge and skills needed by 21st century learners. Furthermore, Jameson (2014) stated that due to the accelerating growth in educational technology and social media usage, the environment experienced by pupils, staff, schools and parents is radically changing, to the point that online 21st century technologies need to play a more significant role in education than ever before. 21st century learners are those have grown up with technology. They are achievement orientated and competent in a technological world; they prefer group work; they have short attention spans; they are digitally literate; socially aware; and they are visual and kinesthetic in their learning (Gronow, 2007). They demand quick access to new

knowledge (Blair, 2012) and they learn differently from their parents because they are influenced by the technology (Doherty, 2005).

The advancement of ICT in knowledge economy has triggered the need for systemic changes in public schools (Flanagan & Jacobsen, 2003). A successful technology integration transformation in school is vital for teachers to fit themselves in a situation where their students are 21st century learners who are excellent ICT users (Blair, 2012). This is further supported by Moyle (2010) states "learning with technologies raises the right issues and should provoke valuable dialogue among those seriously concerned about educational reform" (pg. vi). There was a general consensus on the issue regarding Malaysia education reform. Report published by the ASLI-CPPS, PROHAM, & KITA-UKM in the year 2012 states "the last education reform under the Razak Report 1956 is outdated and does not reflect the current educational needs of a new generation of young people in the 21st century" (p.3). Thus, a tremendous amount of money has been invested by the Malaysia government in educational reform and implementation of ICT in school. Various ICT projects have been implemented in schools and one of it is Multimedia Super Corridor (MSC) project.

In the year 1996, MSC was launched by the Malaysian government as the major initiative for the global ICT industry. MSC is implemented in three phases across the year from 1996 to 2020. The vision of MSC for Phase 1 (1996-2003) is to successfully create the MSC; Phase 2 (2004-2009) to grow MSC into a global ICT hub, and Phase 3 (2010-2020) to transform Malaysia into a knowledge society. Smart School is one of the seven flagships under the MSC. The smart school has been systemically reinvented in terms of school administration as well as teaching and learning process that focusing on student's achievement and development to prepare them for technologically advanced

future (Mirzajani et al., 2016). It is believed that the smart schools initiative is likely to change the traditional policies and practices of the curricula system, the educational delivery system and the educational evaluation system (Hamzah, Ismail, & Embi, 2009). Besides, the authors stated that providing human resources and knowledge workers for ICT companies and industries is one of the core purposes of smart schools initiative.

According to Leong, Chua, Kannan, & Shafinaz (2016), the new broad concept of 'ICT in education' had operates on a greater scale compared to the smart school initiative. These include amalgamating multi-level efforts from the individual level to Ministry of Education (MOE) level. Stakeholders from all level including alumni, practitioners, teachers, students and parents contribute their efforts in providing valuable feedback and approach in ensuring successful implementation of ICT in education. On the other hand, MSC Malaysia would play their part in ensuring successful integration of ICT in education by providing support in terms of resources, maintenance, services and solutions (The Economic Planning Unit of Prime Minister's Department, 2010). Furthermore, the Interim Strategic Plan 2011-2020 have made a priority on the usage of ICT in teaching and learning process, in the field of administration and management of schools in educational institutions in order to help Malaysia moving toward a developed nation (Ministry of Education, 2012b).

In 2012, Malaysia Education Blueprint 2013-2025 was introduced to develop a new education vision and to generate a major transformation in Malaysia's education system (Ghani, 2013). Malaysian Education Blueprint is a detailed plan of action that provides education landscape for the next 13 years (2013-2025). The aims are to raise the international education standards, increase parental and public expectation of Malaysia education system and preparing better Malaysian students for the competitiveness of the

21st century. The Blueprint also offers a vision of the education system and students that Malaysia both needs and deserves. There are 11 operational shifts and strategic suggested in the blueprint that will help to achieve the vision of education plan. Shift number seven among the eleven shifts is related to the leverage of ICT to upgrade the quality of learning of Malaysia learners.

In accordance with the government's vision of giving quality Internet-enabled education for all, along with the technological advancement of the 21st century, Ministry of Education Malaysia (MOE) had initiated a project known as 1BestariNet and it is one of the many initiatives identified under the first wave of the Malaysian Education Blueprint (2013-2015). The 1BestariNet Project was an initiative undertaken by the MOE and completed in association with YTL Communications Sdn. Bhd. to substitute and upgrade ICT availability in schools (National Audit Department, 2014). Hiong & Umbit (2015) stated that 1BestariNet project not simply served as a noteworthy impetus for Internet penetration in Malaysia, however, increases national income of the country as well. Under the project, 10000 schools will be equipped with an integrated solution allowing teaching, learning, collaboration and administrative functions to take place through the Internet-based Virtual Learning Environment (Frog VLE) and a high-speed connectivity (New Straits Times, 2014). According to Siti Faizzatul Aqmal et al. (2014), the introduction of Frog VLE helps 21st century learners to learn best in this new era, to become successful in their education and life as well as improve the quality of schools in Malaysia as a whole. Implementation of 1BestariNet is estimated to keep running over for 13 years and is hoped to transform Malaysian education by seeing more technology use in the classroom (Cheok & Wong, 2014). They also argue that in Malaysia context, e-learning will only be used as a supplement to the traditional instruction approach and this is often known as blended learning.

Graham, Woodfield, & Harrison (2013), Nsofor, Umeh, Ahmed, & Sani (2014) and Rovai & Jordan (2004) defined blended learning as a thoughtful integration of traditional face-to-face instruction with technology-mediated instruction. Moreover, Graham (2006) notified that the integration of ICT mediated instructional components into the traditional learning experience has increased due to the widespread adoption and availability of ICT and the central role of ICT is emphasized in blended learning.

However, studies between the local and the global shows that school is different even globalization of education occurred (Kathryn, 2003). According to Cheok & Wong (2014), Frog VLE is a virtual learning management system adopted from the United Kingdom, it needed a local assessment to assess the effectiveness of the system. They also argue that inappropriate introduction of ICT into a system may lead to unsuccessful integration of technology into the school. In addition, Benzie (1995) indicated that most of the national programs fail because they were not based on research and they mostly adopted from the non-educational settings. Therefore, there is a demanding need for a research to study more explicitly regarding the implementation and usage of Frog VLE under 1BestariNet project.

Besides, McCarthy (2012) in her writing entitled "Malaysia Education Policy Review: A Systems-Approach to Education Reform" indicated that every single person in the system should understand their role as a participant in the process of transforming education system in Malaysia and the benefits that they will gain. The resultant need for transformation of the education environment has put a lot of focus on the role of school leaders in a relatively resistant environment (Longsworth, 2010). According to Cheng (1994), school principal's role in ensuring successful change has openly recognized by most of the country during the major educational reform. Besides, Bush (2011)

documented based on contemporary evidence from many countries stated that principal is still viewed as being primarily responsible for school performances and outcomes. On the other hand, Flanagan & Jacobsen (2003) stated that school leaders need to develop necessary skills and leadership if ICT integration is seen as part of educational reform in school.

As we know, the arrival of ICT has affected the roles and responsibilities of school principals in huge ways (Mohammed Sani, Ahmad Zabidi, & Husaina Banu, 2013). According to Becta (2003), "five crucial factors influence the development of good ICT learning opportunities in school are such as ICT leadership, ICT teaching, ICT resourcing, general teaching and general school leadership" (p.28). In addition, Leithwood, Louis, Anderson, & Wahlstrom (2004) indicated that school leaders play a significant role in leading student learning, leading to school vision and mission as well as facilitating and supporting teachers toward continual school improvement. Integrating technology into education is one of the responsibilities of the school principal (Flanagan & Jacobsen, 2003). Besides, to be responsible that the investment and otherwise, of technologies implementation in the school is beneficial to the entire community are the responsibilities of school principal too (Gronow, 2007).

School principals should pay attention to the technology issues in school (Reeves, 2004). One of the technology issues in implementing ICT in school is the low usage of ICT. Because of the gap between the availability of technologies and low usage of technologies, the role of school principals and teachers is receiving a lot of attention and there is a mounting pressure placed on educators to transform schools (Flanagan & Jacobsen, 2003). Given the expanding weight exerted by technological advancement, it is imperative to comprehend the hidden elements behind teachers' choices in regards to

ICT. Numerous components are indicated as boundaries of low usage of ICT in school. For example, attitude, gender, age, knowledge and skills, perception, experiences in using ICT, ICT training experience and support are frequently cited and connected with boundaries to integrate ICT effectively in schools. Among the many ways of assessing an information system's effectiveness and success, end-users' attitude is one of the most widely used measures (Kandasamy & Parilah, 2013).

Becta (2004) indicates that teachers need to understand that ICT will benefit them for them to possess a positive attitude toward the use of ICT. Cox, Preston, & Cox (2000) also argued that teachers will not use technology in school if they see no need to change. Besides, both Becta (2004) and Bingimals (2009) have documented that reluctant to change is one of the main barrier for teachers to integrate ICT into educational settings. The author urged that teachers should be open-minded toward new ways of teaching including integration of ICT into the classroom. Korte & Hüsing (2006) found that teachers who do not use ICT in class usually with an opinion that the use of ICT does not benefit them in any way. In addition**,** Bush (2011) indicated that if leaders and teachers believe that the technology initiatives are inappropriate for their usage, they are unlikely to implement it with enthusiasm. Furthermore, Watson (1999) argued that teachers need to change in order to implement ICT in school successfully. He added that teachers' attitudes to change play a vital role because teachers' beliefs influence their teaching and learning activities in the classroom**.**

Additionally, Goos & Bennison (2008) reported a similar phenomenon in Australia. Their survey conducted to determine the viewpoints of mathematics teachers with respect to computer software packages, the Internet, and graphics calculators in 257 government and 199 non-government secondary schools in Queensland, Australia.

From their study, they proposed that educators with positive attitudes were more inclined to utilize technology than those with negative beliefs. The writers claimed: "it is a mistake to assume that simply supplying schools with hardware and software will increase teachers' use of technology and encourage more innovative teaching approaches" (p. 126). Thus, implementation of technology initiatives requires positive attitude from those who willing to implement these changes. Undoubtedly, it is imperative to identify the end-users' attitude toward using the ICT and the role of the principal as well in order to use ICT effectively in the school. Therefore, the purpose of this study is to identify the relationship between principals' e-leadership with attitudes of teachers toward using the Frog VLE and researcher hope that this study would help to illuminate these important issues.

1.2 Statement of the Problem

Despite all the investments in ICT infrastructure to enhance education in numerous nations, Gulbahar & Guven (2008) indicated that large amount of money have been invested in educational technology but there are limited evidence on the use of ICT in teaching and learning. This is further supported by Cuban, Kirkpatrick, & Peck (2001) that carried out a study to explain the high access and low use of ICT in school. Their interview results' showed that the presence of technology alone does not increase the usage of ICT among teachers and students. More recent, Lim, Zhao, Tondeur, Chai, & Tsai (2013) documented that there are two noteworthy gaps in the usage of technology for education purposes that need to be confronted which known as the usage and outcome gap. The authors addressed that comparative study on technology usage inside and outside the school are extensive and much less intensive. Secondly, the outcome gap where "the gains in terms of reduced costs and increased productivity achieved by schools is significantly smaller (p. 59)" as compared to the sectors outside education

(Lim et al., 2013). Despite greater access to ICT in schools, there is still a wide gap between technology presence and use in the classroom and schools (Cuban et al., 2001; Fong, Ch'ng, & Por, 2013; Lim et al., 2013).

In Malaysia context, The Interim Strategic Plan 2011-2020 has made a priority on the usage of ICT in teaching and learning process and in the field of administration and management of schools (Ministry of Education, 2012b). 1BestariNet is one of the projects initiated by the Malaysian Ministry of Education in line with the government's vision of providing quality, Internet-enabled education for all as part of the Malaysian National Education Blueprint (New Straits Times, 2014). Under 1BestariNet, schools will be equipped with an integrated solution allowing teaching, learning, collaboration, and administrative functions to take place through the Internet-based Virtual Learning Environment (Frog VLE). Descriptions on the functions of Frog VLE and screenshot of the 1Bestari web page will be presented in Appendix A. The government will fork out a total of RM3 billion over 15 years to pay for the 4G network infrastructure and the maintenance of the Frog VLE (Malay Mail Online, 2014). However, according to the 2013 Auditor-General's report, Series 3, the level of VLE usage by teachers, students and parents was very low which is in the range of 0.01% to 4.69% (Ministry of Finance., 2014). This indicates that there appears to be an unexplained gap between the amounts of money spends on ICT in education and the anticipated return of Frog VLE usage.

The issue of low usage of Frog VLE amongst teachers leads us to a few inquiries, for example: 'Why the teachers do not use the Frog VLE to carry out their daily routine duties?; Does the attitudes of the teachers play a role in ensuring them to use Frog VLE in carrying out their duties as a teacher?'. Hiong & Umbit's (2015) study on the factors that impact the use of Frog VLE among lecturers found that lecturer's attitude was the

main factor influencing the use of Frog VLE. In addition, Chua & Chua (2017) mentioned that teachers negative attitude toward using Frog VLE have reduced the rate to use Frog VLE in the school. Hence, it is the interest of this study to investigate the level of teachers' attitudes toward using the Frog VLE in secondary public school in Klang district.

Besides, there have been studies on implementation and usage of Frog VLE in Malaysian schools (Ana Haziqah, 2014; Ching, 2014; Chua & Chua, 2017a; Hiong & Umbit, 2015; Kamaruddin, 2014; Kaur & Noorma, 2015; Mohamad Ali, 2015; Nurul Farhana, 2013) but only Chua & Chua's (2017a) study relate to the role of a school leader in implementing Frog VLE effectively. In addition, from literature search researcher found out that most of the academic literature on virtual learning environment is from Higher Education institution (Fan, Chen, Wang, & Chen, 2014; Hiong & Umbit, 2015; Jameson, 2013; Liaw & Huang, 2003; Liaw, Huang, & Chen, 2007; Wong & Atan, 2007). This dearth of information concerning the utilization of VLE in higher education aroused interest in researcher to embark on this study in lower level education institution such as secondary schools. This is further supported by Ofsted Survey (2009), it showed that secondary schools surveyed on VLE were less concerned and the use of VLE in secondary schools was limited. The researcher foresees that there is a need to study the implementation of virtual learning environment specifically Frog VLE in secondary schools.

School principals need to know about government visions and expectations (Gronow, 2007). According to Malay Mail Online (2014), Ministry of Education hopes to increase the usage of Frog VLE to 30-35 % in a year since the usage of Frog VLE is only around 5 % during the first 3 years of Frog VLE implementation. Being aware of that, school

principals in Malaysia need not be just a manager of school that taking care of stuff but to be an e-leader that influence people to carry out the mission and vision of the school (Chang, 2012). Thus, it is now vital that the school principal effectively leads the school through a process that is mediated by ICT.

School leaders play the significantly important role in making the vision for ICT implementation at all levels including school, district and national level (Leong et al., 2016). Furthermore, according to Herring, Koehler, & Mishra (2016), school leaders have the possibility to affect the contexts of how ICT is implemented and managed in school. Hence, it can be seen clearly that school principal would significantly influence the uptake of ICT in school. According to Kazi Enamul, Ahmad Zabidi, & Mosa (2012), ICT is not appropriately used for school management purposes in Malaysia. They collected data from 260 Malaysian school teachers, teachers' supervisors and principals who are studying Masters in Educational Management Program in University of Malaya, Malaysia in the year of 2009/2010/2011. Thus, in this study researcher noted that there is a need to further examined the role of school's principals and teachers in implementing Frog VLE in Malaysia.

Besides that, positive attitudes of teachers have been suggested as part of prominent components to the success integration of technology in school (Demirci, 2009; Harrison & Rainer, 1992; Mojgan, Kamariah, Wong, Bahaman, & Foo, 2009; Teo, 2008; Williams, 2015; Yildirim, 2000). As Baylor & Ritchie (2002) states "regardless of the amount of technology and its sophistication, technology will not be used unless faculty members have the attitudes necessary to infuse it into the curriculum" (p. 4). On the other hand, Ling & Mohammed Sani (2013) stated that it is important that leadership

development of school leaders to acquire leadership qualities that are crucial in changing teachers' attitude.

Thus, principals and teachers in the school are believed to have the most responsibility in ensuring high usage of Frog VLE. There is an increasing body of literature that draws a strong connection between principals' leadership with teachers' attitude (Adegbesan, 2013; Kursunoglu & Tanrıogen, 2009; Ling & Mohammed Sani, 2013; Ottestad, 2013). For example, Lai & Yin (1997) showed that the woman principals' leadership are associated with teacher work attitudes. Besides, Kim (2011) in her study stated that relative to instructional leadership, organizational leadership is more strongly positively related to teacher attitudes. In addition, Kursunoglu & Tanrıogen (2009) showed that principals' instructional leadership practices are positively correlated with teachers' attitudes toward organizational change. The research findings on principals' leadership with teachers' attitude vary widely and there is also contradicting findings. However, the researcher found out that there is no research has been done precisely on the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE.

Further supported by Avolio et al. (2014) noted that although prior research has examined the cascading and bypass effects of leadership but none of this research has examined what happens when leadership processes are connected via ICT. Furthermore, according to Harris, Jones, & Baba (2013), "the establishment of digital platform as a way of supporting professional learning is now ubiquitous, and this has underlined the need to explore and understand leadership in virtual setting" (p.926).

Avolio, Sosik, Kahai, & Baker (2014) in their paper entitled "E-leadership: Re-examining transformations in leadership source and transmission" found out that there is a gap between the practice and implementation of ICT and what we know about its effects of e-leadership. Despite the term e-leadership was introduced more than a decade, the empirical evidence about its potential effects of these technologies on the leadership dynamic in or outside organizations and indeed any contemporary, independent evidence about e-leadership practice remains relatively limited (Avolio et al., 2014). There is an urgent need for more research to focus on how distinct leadership styles incorporate with some of the latest ICT because there have been relatively little reported in the e-leadership literature (Avolio et al., 2014; DasGupta, 2011; Hambley, O'Neill, & Kline, 2007; Hanna, 2007; Jameson, 2013). Likewise, Lovelace (2015) noted that e-leadership theory research has yet to analyze instruments that work concurrently to measure leaders' e-leadership characteristics. Generally, we have relatively little understanding in e-leadership and there has been relatively little attention paid to the impact of social, cultural, and physical distance that is mediated on e-leadership.

Moreover, Mishra, Henriksen, Boltz, & Richardson (2016) stated that the biggest challenges of e-leadership studies is that "a significant portion of the literature on this area has focused on business or corporate settings, with relatively little attention paid to what these ideas mean for schools and other educational contexts (p. 251)". Thus, due to the lack of empirical evidence and literature on e-leadership studies in the education context, researcher aim to conceptualized e-leadership practices of school principals based on the context in public secondary schools in Klang districts in this study. It is critical that e-leadership to be studied in context, as "in the case of e-leadership the

context not only matters, it is a part of the construct being studied" (Avolio, Kahai, & Dodge, 2000, p. 616).

As we know, principals play a crucial role in ensuring the investment, financial and otherwise, the use of Frog VLE is beneficial to the entire community of the school. Arguably, however, even with the best technology and fastest speed of 4G Internet connectivity with effective principals' e-leadership, the usage of the Frog VLE will not increases without the right attitude of teachers toward using the Frog VLE. Therefore, researcher utilizes literature on the attitude of teachers toward using the Frog VLE and it is what needs to be further examined in this study.

Due to relatively little empirical evidence on the direct relationship of e-leadership and teachers' attitude toward using ICT, the researcher had a keen interest to establish the relationship between principals' e-leadership and teachers' attitude toward using the Frog VLE. In addition, there is no research on principals' e-leadership to point as a central role to be played in overall teachers' attitude toward using the Frog VLE in Malaysia context. We are clear about the role of principal leadership and teachers' attitude toward increasing the usage of ICT in school but what we need to clarify here is regarding the direct relationship of principals' e-leadership to point as a central role to be played in overall teachers' attitude toward using the Frog VLE. Besides, it is predicted that there is a significant relationship between principals' e-leadership practices with regard to teachers' attitude.

In addition, given there is evidence of the relationship between principals' e-leadership practices and teachers' computer-mediated communication competence in terms of skills, knowledge and motivation (Chua & Chua, 2017a; Kannan et al., 2012;

Lord & Brown, 2001; Mwawasi, 2014; Van Niekerk, 2009; Zaccaro & Bader, 2003) and the relationship between teachers' computer-mediated communication with teachers' attitudes toward using VLE (Koszalka, 2001; Tezci, 2010). There are also evidences of the relationship between principals' e-leadership practices and school virtual learning culture (Blau & Presser, 2013; Chua & Chua, 2017a) and relationship between school virtual learning culture with teachers' attitude toward using VLE (Arokiasamy, Abdul Ghani Kanesan, & Aziah, 2015; Ahmad Fauzi, Kamariah, & Rohayati, 2014; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008; Kollias, Mamalougos, Vamvakoussi, Lakkala, & Vosniadou, 2005). Chua & Chua (2017a) in their study stated that teachers' attitude toward using the e-learning platform; their knowledge of computer-mediated communication competence networking, and school virtual learning culture play an important role in ensuring high quality of e-leadership in schools. Thus, it is proven by research shows that principal e-leadership, teacher CMC competence, school virtual learning culture are related to one another.

Based on the mediation model proposed by Baron & Kenny (1986, p.1176) as shown in Figure 1.1, it is proposed that the computer-mediated communication competence of teachers and school virtual learning culture are a significant mediator for the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE. Generally, "moderator variables always function as independent variables and specify when certain effects will hold, whereas mediating events shift roles from effect to causes, depending on the focus of the analysis and speak to how or why such effects occur" (Baron & Kenny, 1986, p. 1176). The moderation model of Baron & Kenny (1986, p.1174) is as shown in Figure 1.2.

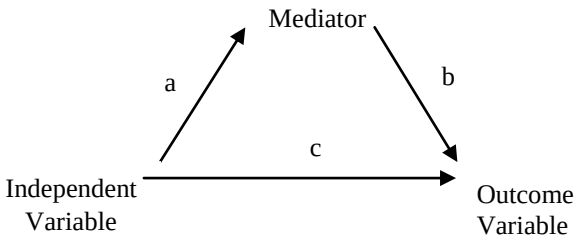

Figure 1.1: Mediation Model Proposed by Baron & Kenny (1986, p. 1176)

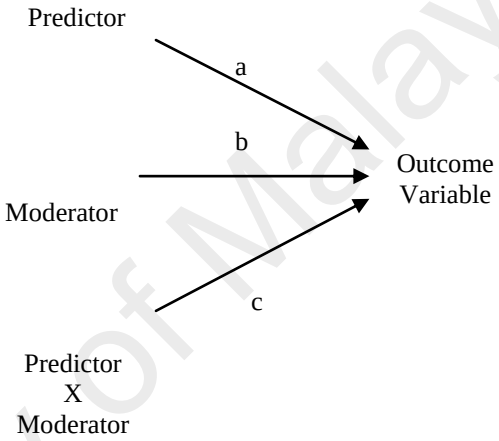

Figure 1.2: Moderator Model Proposed by Baron & Kenny (1986, p. 1174)

In addition, previous studies have indicated that there is significant correlation between teachers use of ICT in school with demographic variables such as gender (Cakir, 2014; Hung & Hsu, 2007; Kusano et al., 2013; Li & Kirkup, 2007; van Braak, Tondeur, & Valcke, 2004), age (Cakir, 2014; Cavas, Cavas, Karaoglan, & Kisla, 2009; Hung & Hsu, 2007; Nabeel, Shahrir, & Chin, 2013), computer experience (Cavas et al., 2009; van Braak et al., 2004), and teaching experiences (Albirini, 2006; Becker, 1999; Christensen, 1997; Kusano et al., 2013; Sadik, 2006). Based on the moderator model of Baron & Kenny (1986, p. 1174) as shown in Figure 1.2, it is proposed that teachers' demographic characteristics such as gender, age, computer experience and teaching

experiences are the significant moderator for the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE.

Thus, based on previous literature findings and problems stated, in this study, the researcher aims to investigate the relationship between principals' e-leadership with teachers' attitude toward using the Frog VLE. Furthermore, the researcher will identify the mediating effect of teachers' computer-mediated communication (CMC) competence and school virtual learning culture as well as the moderating effect of teachers' demographic characteristics such as gender, age, computer experience, and teaching experiences on the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE. Specifically, a conceptual framework is frame by the researcher to find out whether the principals' e-leadership practices have a direct relationship with teachers' attitudes toward using the Frog VLE or it is mediated by the CMC competence and school virtual learning culture or moderated by teachers' demographic characteristics such as gender, age, computer experience, and teaching experiences.

1.3 Objectives of the Study

1. To identify the level of teacher attitude, school principal e-leadership practices, teacher computer-mediated communication (CMC) competence and school virtual learning culture toward using the Frog VLE in Klang district secondary schools.
2. To identify the relationship between principals' e-leadership practices with teacher computer-mediated communication (CMC) competence, school virtual learning culture, and teachers' attitudes toward using the Frog VLE in Klang district secondary schools.

3. To explore the mediating effects of teachers' CMC competence on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools.
4. To explore the mediating effects of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools.
5. To assess the moderating effects of teachers' demographic characteristics on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools.

1.4 Research Questions

This study seeks to answer the five main research objectives as outlined in section 1.3. The research questions by main research objectives of this study are as follows:

1. What is the level of teachers' attitude toward using the Frog VLE in Klang district secondary schools?
2. What is the level of e-leadership of school principal toward using the Frog VLE in Klang district secondary schools based on teacher perception?
3. What is the level of computer-mediated communication (CMC) competence of teachers toward using the Frog VLE in Klang district secondary schools?
4. What is the level of school virtual learning culture toward using the Frog VLE in Klang district secondary schools in Klang district secondary schools?
5. Is there any relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?
6. Is there any relationship between principal e-leadership with teacher CMC competence toward using the Frog VLE in Klang district secondary schools?

7. Is there any relationship between teacher CMC competence with teacher attitudes toward using the Frog VLE in Klang district secondary schools?
8. Is there any relationship between principal e-leadership practices with school virtual learning culture in Klang district secondary schools?
9. Is there any relationship between school virtual learning culture with teacher attitudes toward using the Frog VLE in Klang district secondary schools?
10. Is there any mediating effect of teachers' CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?
11. Is there any mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?
12. Is there any moderating effect of teachers' demographic characteristic such as age, gender, teaching experience and computer experience on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?

1.5 Significance of the Study

In Malaysia, research regarding e-leadership in the field of education is relatively new. This study went a step beyond the intent and studies the relationship between principals' e-leadership practices and teachers' attitudes toward using the Frog VLE. Fundamentally, this study will add to the general body of knowledge on the relationship between principals' e-leadership and teachers' attitudes toward using the Frog VLE. An empirical study of the relationship between these variables can elucidate the centrality of teachers' attitude. In addition, principals will be provided with new paradigms to improve the attitudes of teachers toward using the Frog VLE through this study.

Furthermore, it is able to raise awareness regarding the important of teachers' attitude toward using the Frog VLE and increase the usage of Frog VLE among teachers, students, and parents.

Several studies on the intent of people to utilize technology in educational settings have put their center of interest in investigating the influence of teachers' attitudes (Teo, 2009). Results of this study enable school leaders to have a more thorough understanding regarding the importance of the e-leadership role that a school principal should play in the 21st century world of education. This eventually helps them to develop the skills needed and at the same time raise awareness among school leaders to fully utilize and increase the use of educational technology innovation provided by the government. In essence, this study helps to develop and extend the knowledge in the field of e-leadership in Malaysia education context.

As the project of 1BestariNet is newly introduced by the government in March 2012 and tested by 30 schools as the pilot project only (Ministry of Education, 2012), this research is significant as there is not much research done yet on the design of Frog VLE framework regarding principals' e-leadership and teachers' attitudes explicitly. Since a large amount of money has been invested in the implementation of Frog VLE, this study will benefit the Ministry of Education (MOE) Malaysia. This is further supported by Ministry of Finance (2014) indicated that for the purpose to increase the usage of Frog VLE among teachers, students, and parent, the government has spent a total of RM513.31 million for the license and maintenance of Frog VLE for only 2 years and 6 months. Therefore, there is a need for this study to provide empirical evidence for the policy maker to enhance the shortcomings identified by the Auditor-General's 2013 report (National Audit Department, 2014) as mentioned earlier in this study.

In addition, this study provides a literature review of instruments developed to measure principals' e-leadership and teachers' attitudes toward using Frog VLE. This study provides a valid instrument which measured principals' e-leadership from three different dimensions which are the purpose, people, and structures and social systems. This study also provides a valid instrument which was consisted of three main subscales, namely: affective, cognitive and behavioural which affects teachers' attitudes toward using the Frog VLE. This 1BestariNet project is very recent in Malaysia and there is not enough systematic research to understand teachers' attitudes toward this innovation. This questionnaire may enable such research.

Past studies have concluded that teachers who are happy and satisfied with their e-learning framework will keep on using the system widely. In this way, by having a model that can help us assesses teachers' attitudes, stakeholders are in a superior position to comprehend and create fitting strategies and policies to both maintain and increase the level of teachers' attitudes toward using Frog VLE. Besides, the result of this study could provide principals with data on teachers' demographic characteristics that may impact teachers' attitudes toward using the Frog VLE in education. The factors are age, gender, teaching experiences and computer experience toward the use of Frog VLE.

On the other hand, school virtual learning culture (Chai et al., 2009; Koszalka, 2001) and lack of teachers' competencies (Bingimals, 2009) are the barriers to the integration of technology in education. Teachers' CMC competence in terms of knowledge, motivation and skills (Berner, 2003; Gilakjani & Leong, 2012; Jegede, 2007; Juanna Risah, Wong, & Samsilah, 2005; Koszalka, 2001; Lord & Brown, 2001) and school virtual learning culture (Arokiasamy, Abdul Ghani Kanesan, & Aziah, 2015; Ahmad

Fauzi, Kamariah, & Rohayati, 2014; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008; Kollias, Mamalougos, Vamvakoussi, Lakkala, & Vosniadou, 2005) are believed to associated with teachers' attitude toward using Frog VLE. Hence, based on the data collected on the relationship between principals' e-leadership, teachers' CMC competence, school virtual learning culture and teachers' attitudes toward using the Frog VLE, district or school administrators and VLE content and service providers are able to plan and deliver interventions needed to assist individuals or groups of teachers in implementing Frog VLE.

According to Ministry of Finance (2014), as one of the measures to boost the usage of Frog VLE is to train 5,000 school administrators by end of 2014 and as of April 2014, a total of 420 school administrators have been trained in Institut Aminuddin Baki (IAB). Moreover, the findings of this study could be used as a leadership guideline for IAB to promote principals' e-leadership practices and teachers' computer-mediated communication competencies. This study will also provide information for MOE to manage and conduct suitable training programs for pre-service teachers. As we know, in order to enable a person to have a better preparation to use the system, identification of one's own weaknesses is important.

1.6 Definition of Terms

According to Mohammed I (2003), the purpose of defining terms is to provide the technical details necessary for reproducing the study. All the variables used in this study will be operationally defined in the next section.

1.6.1 Teachers' attitude

The attitude was defined by the Online Oxford Advanced Learner's Dictionary (2016) as "the way that you think and feel about somebody/something; the way that you behave toward somebody/something that shows how you think and feels". For the purposes of this study, the attitude was operationally defined as the teachers' attitudes toward the use of Frog VLE as measured by the instrument developed for this study. The items used to determine what exactly was meant by attitude were listed in section C of the questionnaire (See Appendix B). In this study, researcher adapted questionnaire dealing with teachers' attitudes toward using Frog VLE from Associate Prof Abdulkafi Albirini that published in the paper entitle "Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers" in the year 2006. The level of teachers' attitude toward Frog VLE will be measured according to teachers' self-rated based on affective, cognitive, and behavioural dimensions (Ajzen & Fishbein, 1980; Rosenberg, 1960; Zimbardo, Ebbesen, & Maslach, 1977). Each of the three dimensions will be operationally defined as follow:

1. Affective

   This dimension consists of "a person's evaluation of, liking of, or emotional response to some object or person"(Zimbardo et al., 1977, p.20). In this study, affective component is defined as the degree to which teacher perceives that Frog VLE is enjoyable and they are glad that there is Frog VLE these days. Affective component refer to teachers who do not scare of Frog VLE.

2. Cognitive

   This dimension involves "a person's beliefs about, or factual knowledge of, the object or person" (Zimbardo et al., 1977, p.20). In this study, cognitive component is defined as the degree to which teacher perceives the usefulness

(saves effort; motivate students to study; is a fast and efficient means of getting information; and enhance student's learning) of Frog VLE.

3. Behavioural

   This dimension involves a person "overt behaviour directed toward the object or person" (Zimbardo et al., 1977, p. 20). In this study, the behavioural component is defined as the degree to which teacher perceives that their behavioural intention to use Frog VLE in the near future.

1.6.2 Principals' e-leadership practices

E-leadership was defined by Avolio et al. (2000) as "a social influence process mediated by AIT to produce a change in attitudes, feelings, thinking, behaviour, and/or performance with individual, groups, and/or organization and can involve one-to-one and one-to-many interactions within and across large units and organizations" (p. 617). In the year 2013, Jameson's e-leadership framework grouped key successful school organizational leadership categories into three main areas such as purpose, people, and structures and social systems. In this study, e-leadership refers to leadership practices in terms of purpose, people and structures and social systems that able to change teachers' attitude toward using Frog VLE, teachers' computer-mediated communication competence and school virtual learning culture. To answer the research question, three construct variables are utilized as indicators of principals' e-leadership. Each of the three constructs will be operationally defined as follow:

1. Purpose

   This dimension acquires principals to show the knowledge and skills in terms of e-leadership visioning and strategic planning; developing attainable and specific

goals priorities on students' learning; and priorities pedagogic use of Frog VLE in teaching and learning.

2. People

   This dimension acquires principals to show the knowledge and skills in terms of e-leadership presence, communication and speed of response to messages. This dimension also acquires principals to provide human resource and training as well as supporting collaboration among teachers in implementing Frog VLE.

3. Structures and social systems

   This dimension is defined as principals supporting the use of information technology infrastructure. This dimension also acquires principals to show the knowledge and skills in terms of management and operations including provide resources for professional development and speed of updating information through Frog VLE.

1.6.3 Teachers computer-mediated communication competence

Computer-mediated communication was defined by Spitzberg (2006) as, "any human symbolic text-based interaction conducted or facilitated through digitally-based technologies" (p. 630). In this study, the level of teachers' computer-mediated communication competence will be measured according to teachers' self-rated based on the component model of CMC competence measure by Spitzberg (2006) that looked at three different dimensions of CMC competence measure which are (i) motivation (ii) knowledge and (iii) skills. Each of the three dimensions will be operationally defined as follow:

1. Motivation

   "Motivation represents the energizing component of competent performance" (Spitzberg, 2006, p.637). Motivation refers to the enjoyment and pleasure derived resultant from communicating through Frog VLE.

2. Knowledge

   "Knowledge is represented primarily by cognitive characteristics reflecting such constructs as planning, uncertainty reduction, familiarity, expertise, and other indicators of comprehension" (Spitzberg, 2006, p.638). Knowledge refers to teachers who are clear, knowledgeable and show their familiarity in communicating through Frog VLE.

3. Skills

   "Skills are the repeatable, goal-oriented behavioural tactics and routines that people employ in the service of their motivation and knowledge" (Spitzberg, 2006, p.638). Skills refer to teachers who displaying interest, expression, confidence and deft management of timing through Frog VLE messages.

1.6.4 School Virtual Learning Culture

Mees (2008) indicated that the definitions of culture in the field of education are uncertain. Generally, culture is the basic assumptions, the patterns of beliefs, values, behaviours and cultural norms that are shared by different people in a particular group (Truong, Hallinger, & Sanga, 2017). In the school context, Maslowski (2001, p.8-9) defined school culture as "the basic assumptions, norms and values, and cultural artifacts that are shared by school members, which influence their functioning at school". On the other hand, Albirini (2006, p.377) in her study operationally defined "Cultural Perceptions" as "Syrian EFL teachers' perceptions of the value, relevance, and impact of ICT as it relates to the cultural norms of Syrian society and schools".

Additionally, Fullan (2007) defined school culture as the evident of how a school operates in terms of guiding beliefs and values. Besides, Taras, Kirkman, & Steel (2010) indicated that cultural values are necessary but cultural beliefs may clarify part of a culture that is not captured by cultural values. Hence, in this study, researcher operationally defined "school virtual learning culture" as "teachers' perceptions of the cultural values and its cultural beliefs on the impact of Frog VLE as it relates to the cultural norms in Klang district secondary schools that are shared by the school members". The level of school virtual learning culture will be measured according to teachers' self-rated based on the two different dimensions of school virtual learning culture measure which are (i) culture values and (ii) culture beliefs. Each of the two dimensions will be operationally defined as follow:

1. Values

   Truong et al. (2017) defined cultural values as "beliefs about what is good, right and fair that are acknowledged and accepted by members of a social group, whether a formal or informal organization, a tribe or a society" (p. 78). This dimension refers to teacher perceptions about the value and relevance of Frog VLE.

2. Beliefs

   Cultural beliefs may refer to those concepts about the causes and consequences of things, persons, events and processes (Pepitone, 1994). This dimension refers to teacher perceptions about the concepts regarding the impact of Frog VLE.

1.6.5 Teachers' demographic characteristics

Characteristic was defined by the Merriam-Webster (2016) as "a special quality or trait that makes a person, thing, or group different from others". For the purposes of this study, demographic characteristic was operationally defined as demographic

information about daily public secondary school teachers in Klang district as measured by the instrument developed for this study. Demographic characteristics such as age, gender, teaching experience and computer experience of the teacher are non-manipulative personalized information that can't be affected straightforwardly by the school (Drent & Meelissen, 2008).

1.7 Limitations of the Study

The study did not use any diversifies research methods due to time constraints and limited financial support. The questionnaire is the only research instrument for data collection. Therefore, feedback received from the respondents is dependent on the sincerity and honesty of the respondents in answering the questionnaire that might affect the research findings. Furthermore, researcher adapted the instrument from various sources through literature review and this is the first time an attempt is made to examine the relationship between and among the dependent and independent variables defined in this study in the contexts of Klang district secondary school. Therefore, instrumentation bias is one of the limitations of this study.

Besides, research population of this study only involved teachers in particular district in Malaysia because of the accessibility of population to the researcher. This study focused on secondary school teachers in Klang district. Therefore, the results may not be generalizable to teachers at other levels. In addition, subject taught by the teachers is not included as one of the moderating variables in this study. It is one of the limitations of this study as different subject teachers may possess different attitude toward using Frog VLE. Furthermore, the researcher aims to investigate only the individual level of teachers' attitudes toward using Frog VLE because researcher believes that end-user

attitudes play a more vital role in ensuring successful implementation of ICT in any system.

1.8 Summary

In short, this chapter gives an overview of the real purpose of this study through the discussion on the introduction of the study, statement of the problem, objectives of the study, research questions, significance of the study, definition of terms and limitations of the study. Specifically, this proposed study examined the relationship between secondary school principals' e-leadership with teachers' attitude toward using the Frog VLE in Klang district or it is mediated by teachers' computer-mediated communication competence and school virtual learning culture. In addition, the moderating effect of teachers' demographic characteristics on the relationship between principals' e-leadership with teachers' attitude toward using the Frog VLE in Klang district secondary school will be identified. This study documentation has five remaining chapters, a review of the relevant literature (Chapter 2), an in-depth explanation of the methodology used (Chapter 3), the analysis of the data (Chapter 4), and discussion of findings (Chapter 5), and finally conclusions, implications, and recommendations for future studies (Chapter 6). In the following chapter, chapter 2 presents the review of the relevant literature of the study.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction

The literature review section first discusses the relevant theories and models related to e-leadership. Next, the relevant theories and models related to computer-mediated communication (CMC) competence and teachers' attitude are discussed. Following that, current studies on teachers' attitudes toward using Frog VLE, principals' e-leadership practices, teachers' CMC competence, school virtual learning culture and teachers' demographic characteristics are discussed in detail. Subsequently, contemporary studies related to the relationship between principals' e-leadership practices with teachers' attitudes toward using Frog VLE, school virtual learning culture and teachers' CMC competence are discussed. Next, contemporary studies related to the relationship between teachers' CMC competencies and school virtual learning cultures with teachers' attitude are presented as well. Following that, theoretical framework of this study is presented. The researcher compared and contrasted all the findings and reviewed critically. To conclude the review section, the researcher discussed the overview of the conceptual framework proposed for this study and followed by the summary of this chapter.

2.2 Theories and Theoretical Concept Relevant to the Study

This section begins with a detailed discussion on e-leadership theories to give an overview of the theoretical framework of this study. Next, theory of computer-mediated communication (CMC) competence will be further discussed. Finally, this section ends with a discussion of theories and models related to teachers' attitudes toward using Frog VLE.

2.2.1 E-leadership Theory

Technology has changed the definition of leadership as well as the organizations (Avolio et al., 2014). Previously, Avolio et al. (2000) argue that there is a new context for leadership created by technology in this new era of the global economy. Technology and leadership influence each other and work together within the organizational context. Avolio et al. (2014) noted that our comprehension of how the innovation of technology is executed and the effect on how individuals team up and function in an organization is constrained in light of the fact that research in this area has not been explored fully. Jameson (2013) indicated that e-leadership is a fundamental field of study in education because of the continuous progressions of educational innovation and absence of research in this field. Further supported by Mishra et al. (2016) states "one of the challenges of thinking about e-leadership in education is that a significant portion of the literature on the topic has focused on business or corporate settings, with relatively little attention paid to what these ideas mean for schools and other educational contexts (p. 251)". Besides, authors realized that long-established theories of leadership are not adequate for successful leadership practices in ICT-mediated environments but it may be necessary.

Furthermore, Jameson (2013) stated that it is not only necessary but it is vital to have the term e-leadership as a consequence of the advancements of ICT in education and to raise awareness among school leaders regarding the importance of adopting the changes. Jameson (2013) argues "there is a need for e-leadership to emerge and be recognized as a named individual concept in educational technology (p.908)". Similarly, Gurr (2004) indicated that e-leadership will become an important part of educational leadership as more ICT environments are developed in educational settings. Thus, it will be imperative for empirical research on e-leadership to be led in educational settings to

look at the distinctions with non-educational settings. Due to the lack of empirical evidence and literature on e-leadership studies in the education context, the researcher aims to conceptualized e-leadership practices of school principals based on the context in public secondary schools in Klang districts. It is important to study e-leadership in context, as "in the case of e-leadership the context not only matters, it is a part of the construct being studied" (Avolio et al., 2000, p.616).

Through an extensive review of the e-leadership literature, Avolio, Kahai, & Dodge (2000) indicated, "we chose the term e-leadership to incorporate the new emerging context for examining leadership" (p. 617). With the purpose to develop a research agenda on e-leadership and to provide recommendations, Avolio et al. (2000) provide an e-leadership framework based on Adaptive Structuration Theory (AST). AST suggests the impact of the interaction between ICT and leadership on organization structures. AST also suggests that leaders look at the organization structure including ICT to increase efficacy as AST promotes human behaviour. And the framework used to develop leadership theory will associate with ICT and promotes positive behaviour if leaders adapt AST theory. E-leadership is defined as a social influence process mediated by technology from a business and management perspective (Avolio et al., 2000). They referred the ICT as AIT and the definition is as below:

> "E-leadership is defined as a social influence process mediated by AIT to produce a change in attitudes, feelings, thinking, behaviour, and/or performance with individuals, groups, and/or organizations. E-leadership can occur at any hierarchical level in an organization and can involve one-to-one and one-to-many interactions within and across large units and organizations. It may be associated with one individual or shared by several individuals as its locus changes over time (Avolio et al., 2000, p.617)".

Avolio et al. (2000) went further in their discussion to emphasize that e-leaders should create social structures that foster implementation of ICT more proactively. In addition, Avolio & Kahai (2003) viewed e-leadership as the same purpose as traditional leadership. Avolio & Kahai (2003) stated that the only different between e-leaders and traditional leaders is that the e-leadership work is mediated by ICT. Their core is still the same is to enhance the connections among individuals from an organization. They regarded leadership as a dynamic system enclosed inside a bigger organizational system where the organizations create structures that define the relationships expected among people who work in the organizations. In e-leadership context, communications between leaders and followers; the accumulation and dispersal of data needed to support the organization work all occur by means of ICT.

More recently, Avolio, Sosik, Kahai, & Baker (2014) mentioned about the rapid rise in ICT tools including the Internet and virtual teams have increased the quantity of researchers to concentrate on how ICT would change organization's capacity and the suggestions for leadership in those organizations since the late 1990's. The authors noted that there is a need to examine what we've learned about e-leadership, what needs to be learned, and what might constitute emerging topics that could drive the e-leadership agenda over the next decade and beyond. This is because the authors found that although the term e-leadership was introduced into the literature now more than a decade ago but it is still much more to go to understand thoroughly the developments in this area. In their paper entitled "E-leadership: Re-examining transformations in leadership source and transmission", Avolio et al. (2014) documented that how organizations or schools are structured, change and transform will no doubt be affected by the appropriation of ICT in the future.

In addition, Husing et al. (2013) noted that in order to be competitive in today's global digital economy, a new type of leadership known as e-leadership is becoming essential to organizational innovation and competitiveness. Husing et al. (2013) defines "e-leadership as the accomplishment of a goal that relies on ICT through the direction of human resources and uses of ICT" (p. 13). Essentially, e-leaders are leaders who accomplish an ICT-enabled objective through utilization of technology. The authors said that by having strong e-skills is not simply beneficial to competitiveness but it is necessary to avoid wasting investments in ICT. This can be applying to all types of organizations no matter the size or sector including in the field of education. Individuals that are capable of managing and leading an outstanding team in both local and global demands is an effective e-leader (Husing et al., 2013).

Recently, Jameson (2013) proposes an e-leadership approaches to include the adoption of ICT in education as the educational technology field matures. The author found that there is limited research focus on the topic of e-leadership and none focused on the leaders' capability to deal with theory and implementation of ICT. Jameson (2013) noted that there is a need for more research and discussions into how leaders should practice e-leadership. Thus, the author gives a redesigned framework of e-leadership skills and knowledge required for the utilization of viable e-leadership to educational technology in higher education based upon selected prior research. Specifically, major categories identified based on the work of Hollingsworth & Mrazek (2004) and Tan (2010) as well as both Heck & Hallinger (1999) and Leithwood, Louis, Anderson, & Wahlstrom (2004) that looked at effective school principals' leadership practices from the three main perspective such as "purposes", "people" and "structures and social systems". Figure 2.1 showed the e-Leadership framework proposed by Jameson (2013).

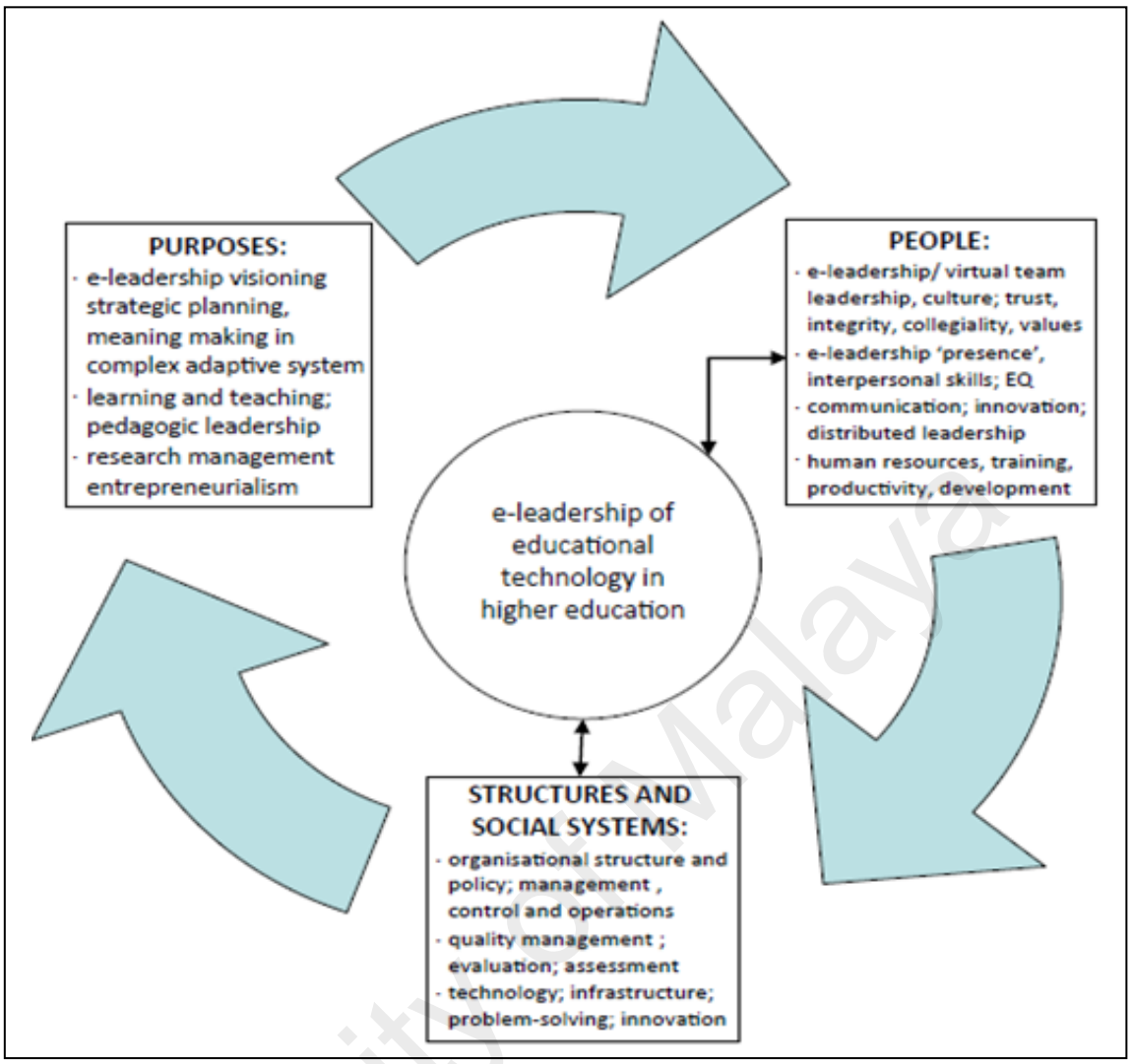

Figure 2.1: E-Leadership Framework for Educational Technology in Higher Education (Jameson, 2013, p. 911)

The e-Leadership framework proposed by Jameson (2013) consisted of three main areas such as "purposes", "people" and "structures and social systems" that grouped successful leadership practices of school leaders into ten groups of e-leadership characteristics. Jameson (2013) indicated that the listed characteristics are necessary and important for an individual to be an effective e-leader at any levels of the hierarchical in higher education. These characteristics help to create high trust environment and promote excellent communication among virtual team members through the development of ICT. The characteristics of the e-leadership framework are listed as below:

E-leadership framework characteristics proposed by Jameson (2013, p.909): “

1. Purpose: e-leadership visioning and strategic planning; meaning making and sense making in complex adaptive systems of higher education organizations.
2. Purpose: learning and teaching, pedagogic leadership
3. People: e-leadership/virtual team leadership of collegiality, organizational values, behaviours and culture; trust, academic freedom; social, legal and ethical issues; diversity and equal opportunities; gender issues
4. Structures and social systems: organizational structure and policy; management, finance and operations including distributed leadership systems, speed of response and change management skills
5. People: e-leadership presence, interpersonal skills, and emotional intelligence; empowering others
6. People: communication skills and organizational relations including speed of response; innovation; risk taking; distributed leadership; ownership
7. Structures and social systems: quality management and monitoring; assessment and evaluation
8. Purpose: research and enterprise management
9. People: human resources, training, productivity and professional practice
10. Structures and social systems: technology, support for infrastructure, problem-solving skills, information technology skills, innovation, risk taking.”

Besides, Jameson (2013) noted that more than twenty years ago, Kearsley & Lynch (1994) concluded from their study that there is a lack of leadership development on technology leadership. Kearsley & Lynch (1994) made a conclusion based upon numerous cases where technology is inadequately utilized with practical nonappearance of any specific training focuses on technology leadership. The authors concluded that

school principals and teachers are not well-prepared in terms of managing and implementing school technology. Thus, it is important to set up formal training programs regarding technology leadership for principals and teachers. Nevertheless, Jameson (2013) indicated that it is disappointed where Kearsley & Lynch's conclusion regarding the essential need for technology leadership training are still exceedingly pertinent in both industry and education sector including lower secondary education across many of the world today. Since, there is little prior research in secondary education that focus on virtual learning platform so this study considers as an emerging field of e-leadership by referring to Jameson's (2013) e-Leadership framework.

2.2.2 Theory of Computer-mediated Communication (CMC) Competence

Spitzberg's (2006) theory of computer-mediated communication (CMC) competence proposes that motivation represents the initial energizing process of knowledge search and application, which manifest through the selection of skills that are applied to the selection of media and messages. On the other hand, knowledge of the most competent messages and media is searched and selected accordingly and subsequently implemented through the skills of CMC. The messages transmitted through the selected media are filtered through the receivers' expectations for messages in those media. Those expectancies are products of the receivers' experiences with CMC and of the receivers' culture, sense of chronemics, relationship, environment, and the anticipated function of the messages. Through ongoing interaction, these expectancies are fulfilled, violated, or renegotiated, and the product of the message exchange and the degree to which expectancies are fulfilled or violated predicts the outcomes of the process for both the original sender and the co-interactants. The components of the CMC competence model have been conceptualized largely from an individual differences perspective but in keeping with the reasoning of summative, compensatory, and

interactive effects (Spitzberg & Cupach, 1984). Generally, it is assumed that competent interactants can facilitate the competence of co-interactants and part of the benefit of competence is the ability to compensate for the incompetence of others.

According to Spitzberg (2006), when positive expectancies are fulfilled, outcomes are generally positive whereas when negative expectancies are fulfilled, outcomes are generally negative. These predictions anticipate main effects for congruence. Specifically, a valence reversal of competence impressions is predicted. For instances, if interactants expect negative outcomes, the most competent response is to violate those expectancies appropriately. In contrast, violation of positive expectancies is likely to produce unpleasant or dispreferred outcomes. These predictions anticipate interaction effects between the valence of expectancy and the valence of response. Spitzberg (2006) stated that the primary value of the CMC component model is in outlining a heuristic scheme for reorganizing much disparate literature into a semantic model that can generate coherent hypotheses. Instead, motivation, knowledge, skills, context, and outcomes serve as metaphorical vessels into which prior and future research can be functionally established. It is presumed that there are real, reducible parallels that serve as the substance of motivation, the substance of knowledge, and the substance of skills, which are moderated by real contextual factors in their influence on real outcomes. Hence, in this study, it is presumed that the CMC competence of teachers in terms of motivation, knowledge, and skills are able to influence teachers' attitudes toward using the Frog VLE which act as a real outcome of this study.

Another presumption of the model is that face to face and CMC interactions are more similar than they are different. Spitzberg (2006) stated that both can be explained by the same general model components, and the components of this model require only

minor adaptation to the particular technological features of the context in most cases. As such, the parameters of the model are that it is proposed presently for all mediated interpersonal types of communication including mediated through Frog VLE in this study. The basic elements of the theoretical model of CMC competence are visually represented in Figure 2.2.

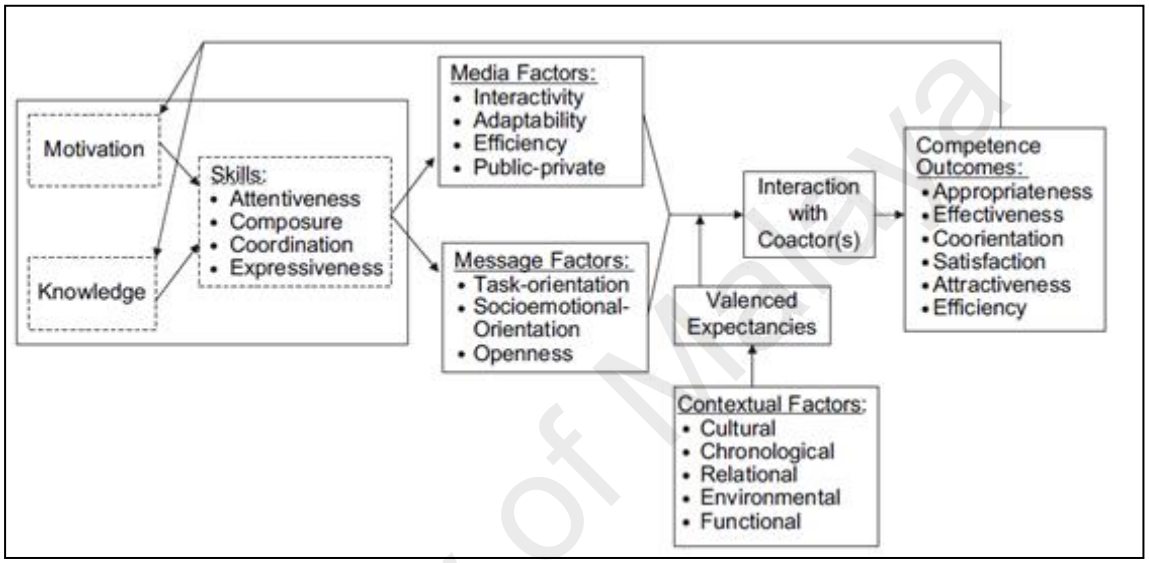

Figure 2.2: A Model of Computer-mediated Communication Competence (Spitzberg, 2006, p. 649)

"Motivation represents the energizing component of competent performance" (Spitzberg, 2006, p.637) whereas CMC motivation is defined as "the ratio of approach to avoidance attitudes, beliefs, and values in a given CMC context" (Spitzberg, 2006, p. 640). Next, CMC knowledge is defined as "the cognitive comprehension of content and procedural processes involved in conducting appropriate and effective interaction in the computer-mediated context" (Spitzberg, 2006, p.641). Finally, skills are "the repeatable, goal-oriented behavioural tactics and routines that people employ in the service of their motivation and knowledge" (Spitzberg, 2006, p. 638).

Spitzberg (2006) stated that motivation and knowledge is not sufficient to transform into action if an individual do not have the necessary skills. However, the author

mentioned that there will be an increase in terms of knowledge and skills when the utilization of CMC technology increases. Furthermore, this metaphor is mirrored in older metaphors of affective, cognitive, and behavioural factors of action and was later imported as a way of organizing research on communication competence (Spitzberg & Cupach, 1984). More recent, it was elaborated to include the structure and expectancies comprising interaction contexts (Spitzberg, 2006). Generally, as CMC competence increases, coorientation, appropriateness, effectiveness, satisfaction, and preferred relational outcomes are more likely to occur.

2.2.3 Attitude Theories and Model

By assessing the relationships between "perceived usefulness", "perceived ease of use", "attitude", "behavioural intentions" and "actual use", Lau & Woods (2008) aims to study how end-users attitudes and beliefs impact higher education learners using the learning objects. Results found that end-users attitude and beliefs are positively correlated with behavioural intention and actual use of learning tools can be predicted by behavioural intention. Thus, they believe that studies about user's perceptions and attitudes toward learning object as the factors in promoting effective use of various information system have become increasingly essential to improve the understanding and prediction of the use of instructive technologies.

According to Kim & Crowston (2011), applied theories and models of social psychology concentrating on peoples' ICT adoption and post-adoption behaviours. For example, these theories and models act as a major theoretical foundation to study individual's intention to participate in a certain behaviour concerning ICT adoption and use. In this study, in order to study the variables used to measure teachers' attitudes toward using Frog VLE, the researcher analyzed the available literature and found that it

is imperative to include the revolution of the attitudes theories and models. Besides, Kim & Crowston (2011) stated that theories and models played a critical role in research regarding adoption and use of ICT. The authors added that theories and models act as a guideline for researchers to build their research design as well as helping them to interpret the research findings. Thus, for the purpose to answer the research objective of this study, it is critical to understand and analyzed theories and models regarding attitudes toward the use of instructive technologies. Discussions on the most influential adoption theories and models that are related to this study are presented in the following sections. Four theories which are Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT) and Diffusion of Innovation Theory (DOI) are presented as the theoretical framework for the building of the two attitudes model which are Technology Acceptance Model (TAM) and Tripartite Model.

2.2.3.1 Theory of Reasoned Action

According to Ajzen & Fishbein (1980), Theory of Reasoned Action (TRA) as proposed by Fishbein & Ajzen (1975) is based on the assumptions that "human beings are usually quite rational and make systematic use of information available to them" (p.5). "Social psychologists suggest that attitude includes behaviour and cognition, and that attitude and behaviour are positively correlated" (Shareef, Kumar, Kumar, & Hasin, 2009, p.547). The authors added that the fundamentals of the TRA are among the attempt to explain how and why attitude affects behaviour.

Fishbein & Ajzen (1975) defined attitude as "an individual's positive or negative feelings about performing the targeted behaviour" (p.302) and subjective norm as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" (p.302). Attitudes (Hsieh, Rai, & Keil,

2008) and subjective norm (Venkatesh & Davis, 2000) were observed to be imperative determinants of peoples' intentions to adopt and use ICT. Furthermore, TRA has been utilized widely as a fundamental theoretical framework for research in the field of educational technologies and it also has been joined by different theories and models (Kim & Crowston, 2011).

Ajzen & Fishbein (1980) mentioned that by measuring individual's attitude toward practicing certain behaviours, individual's subjective norm, and their relative weights able to foresee and gain some understanding of an individual's intention. However, it is necessary to explain why individuals hold certain attitudes and subjective norms for a complete understanding of intentions. Generally, TRA was developed to examine the relationship between the attitudes, beliefs, subjective norm, intentions and behaviours of individuals. TRA assumes that individual's behaviour can be controlled by an individual's intention to perform behaviour, and this behavioural intention is determined by the persons' attitudes and their perceptions of the subjective norms of the behaviour, which could consequently be utilized to foresee and clarify individual behaviours. Factors determining a person's behaviour are as shown in Figure 2.3.

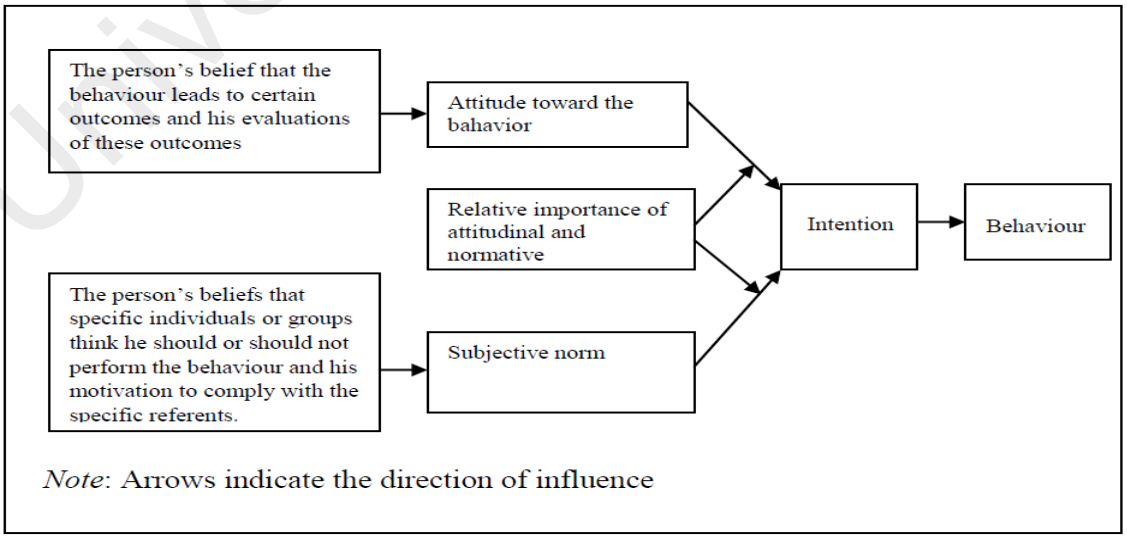

Figure 2.3: Factors Determining a Person's Behaviour (Ajzen & Fishbein, 1980, p. 8)

From the review of TRA, the researcher gets the essence that an individual attitude combined with subjective norms will form the person's behavioural intention which will then lead to the actual behaviour. Individual's behavioural beliefs on the possible results of practicing the behaviour lead to individual's attitudes toward a behaviour (Shareef et al., 2009). For instances, when teachers believe that adopting ICT behaviours will benefit them then their will possess positive attitude toward these behaviours. On the contrary, if teachers think that adopting ICT behaviours does not benefit them at all then they will possess negative attitude toward these behaviours. In addition, the magnitudes of beliefs which in turn affect attitude are different in different context. Thus, the beliefs of an individual weighted by the importance of the individual's attitude to each circumstance or opinion which might subsequently affect the person's behavioural intention to use ICT.

However, the theory is generally restricted by numerous factors that significantly diminish its explanatory power in regards to individual behaviour. In order to improve the predictive power of the TRA, Ajzen (1985) added "attitudes toward behaviour" and "subjective norms" factors which are associated to "perceived behavioural control" that probably affect behavioural intentions. Thus, the theory of planned behaviour (TPB) is formed. In the section below, researcher discusses on TPB.

2.2.3.2 Theory of Planned Bahavior

The Theory of Planned Behaviour (TPB) started as the Theory of Reasoned Action (TRA) in 1980 to predict an individual's intention to practice certain behaviour at a specific time and place (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Both TRA and TPB have been utilized widely in the field of educational technologies (Kim & Crowston, 2011). It depends on TRA to explain an extensive variety of human

behaviour by presenting a comprehensive psychological theory that identifies a causal structure. TPB states that particular prominent beliefs influence behavioural intentions and subsequent behaviour of an individual (Ajzen, 1991). TPB defines relationships between attitude, beliefs, norms, perceived behavioural control, intentions and behaviour. TPB suggests that attitude toward a behaviour, subjective norm, and perceived behavioural control can affect individual's intention to practice certain behaviour. Figure 2.4 showed the model of theory of planned behaviour by Ajzen in 1985.

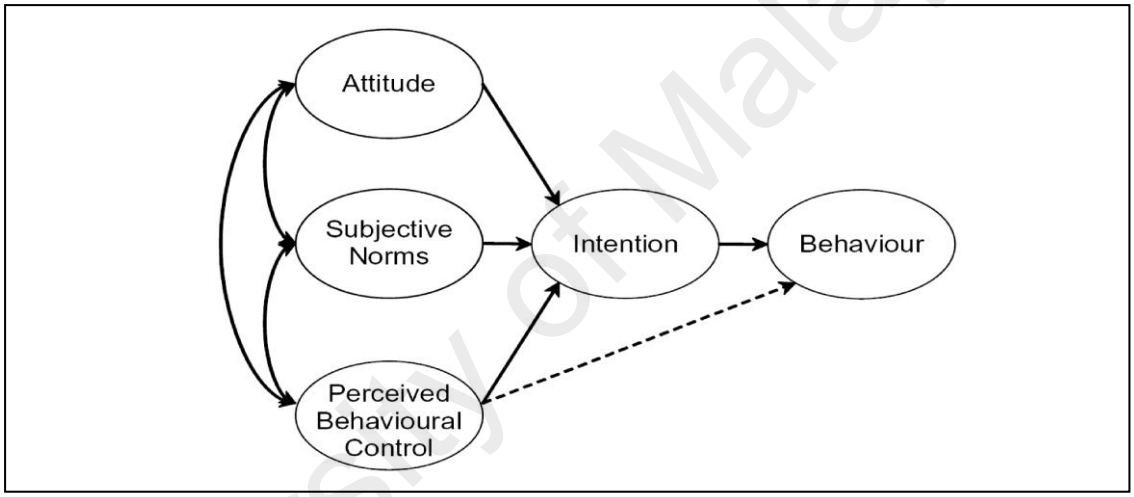

Figure 2.4: Theory of Planned Behaviour (Ajzen, 1991, p.182)

The distinction between TPB and TRA is that TPB introduces the third determinant factor which is perceived behavioural control. Perceived behavioural control refers to people perceptions of control over the performances of the desired behaviour. The behaviour is the product of a succession of cognitive and affective events, preceded many times by the conscious intention of acting. Previous studies found that attitude, subjective norm, perceived behavioural control and behavioural intention are significantly correlated (Ajzen, 1991; Kim & Crowston, 2011)

More recently, De Leeuw, Valois, Ajzen, & Schmidt's (2015) research aimed to investigate the effect of young people's pro-environmental beliefs on their behaviour based on TPB. Aside from the standard TPB constructs, moral norms were added as an additional determinant of intention. Findings indicated that attitudes, subjective norms and perceived behavioural control predict intention and both perceived behavioural control and intention predict behaviour, hence, the data collected fit the standard model of TPB. Moreover, it shows that behavioural, normative and control beliefs influenced intentions and behaviour indirectly.

Similarly, Shareef et al. (2009) relied on TRA and TPB as they study ICT-based online adoption and diffusion globally. The authors have identified theoretically different attributes of technology usage beliefs which in turn affect attitude, subjective norm, and behavioural control of online technology acceptance. These three factors affect behavioural intention to accept an ICT-based online system which leads to actual behaviour regarding acceptance of the online system. The authors indicated that "TPB is a theory that predicts intended and rational behaviour, because behaviour can be deliberative, organized, and planned" (p.548). The authors concluded by proposing a theoretical framework of ICT-based online adoption which grounded in TRA and TPB under the virtual environment context and stated that it has significant implications for technology adoption behaviour.

Generally, based on TPB, an individual's beliefs are associated with their intention and their intention is associated with the actual behaviour. TPB provides a theoretical justification for the association between both beliefs and intentions in the present model. Additionally, Ajzen (1991) argued that an individual behaviour is strongly influenced by their capacity to carry out a specified duty (perceived behavioural control). Ajzen

(1991) indicated that behavioural achievement can be predicted by both perceived behavioural control and behavioural intention. Therefore, in the present study, it is proposed that teachers' belief about computer-mediated communication competence and school virtual learning culture are linked to teachers' attitude toward using Frog VLE in Klang district secondary public schools.

2.2.3.3 Social Cognitive Theory

Behaviour of an individual is described by Social Cognitive Theory (SCT) from the perspective of the reciprocal feedback system of behavioural factor, environmental factor, and personal attributes. SCT also highlights the idea that majority of the human learning process occurs in a social environment (Bandura, 1977). SCT has become a fundamental resource in educational, social, developmental and personality psychology and has been applied to school achievement (Luszczynska & Schwarzer, 2007).

Bandura (1986) stressed that SCT had been used widely in studying individual's adoption of innovation system in terms of their belief and attitude development. For example, social learning through modeling where individuals observed others adopting particular innovation of ICT and they are willing to accept or to consider adoption themselves. The individual will also learn about the appropriateness and usefulness of behaviours by observing certain agents who act as models. The consequences of modeled others behaviours, individuals tend to act by following their beliefs regarding the expected performances outcomes. Thus, an individual actually acquire skills, knowledge, beliefs, attitudes, rules and strategies through observation. Finally, someone's experience that is either successfully or unsuccessfully in using the ICT may influence others. On the other hand, SCT suggests that both outcome expectations and self-efficacy influenced behaviours and they are affected by existing behaviour.

According to Bandura (1997), people belief that their actions contributed to the success of the particular task, and a self-evaluation of their abilities to perform the task also should be considered to predict human behaviour. As indicated: "beliefs that outcomes are determined by one's own behaviour can be either demoralizing or empowering, depending on whether or not one believes one can produce the required behaviour" (Bandura, 1997, p. 20). Furthermore, Luszczynska & Schwarzer (2007) noted that based on SCT, behavioural change is made possible by a personal sense of control. Supposing that an individual trust that they can make a move to solve a problem effectually, they become more inclined to do so and feel more committed to the decision. This is further supported by McFarland & Hamilton (2006) stated that an individual's behaviour is guided and motivated by their self-conceptualizations regarding their future. Thus, people tend to develop self-images of future success or failure by combining those beliefs. In term of teachers' attitudes toward using virtual learning platform, specifically Frog VLE in this study, the researcher believes that individual's judgement on their ability to complete the given tasks is connected closely with their attitudes toward using the technology tools.

More recently, Bandura (2001) stated that technological advancement has radically altered the social diffusion process of technology and ICT are coming to play a progressively compelling part in transcultural change. Bandura (2001) indicated that new behaviours pattern of individuals is analyzed through three constituent processes. Firstly, acquisition of knowledge about the behaviours followed by the adoption of these behaviours in practice and finally the social networking through how they are supported and distributed. "Social practices are not only being widely diffused within societies, but ideas, values, and styles of conduct are being modeled worldwide" (Bandura, 2001, p. 287). Bandura (2001) also documented that diffusion of innovation

by Rogers (1995) follows a common pattern. Thus, in the following section, the researcher will discuss on the diffusion of innovation by Rogers (1995).

2.2.3.4 Diffusion of Innovation Theory

Individual's attitudes play a critical role in the process of making a decision whether to use a new technology (Rogers, 1995). The diffusion of innovation framework appears to be suitable for ICT-related study as the words innovation and technology are used by Rogers in his writing (Albirini, 2006). Rogers Innovation Decision Process theory states "an innovation's diffusion is a process that occurs over time through five stages, namely: knowledge, persuasion, decision, implementation and confirmation" (Rogers, 1995, p. 161). The five stages innovation-decision process through which individual passes are listed as below: "

1) from first knowledge of an innovation,
2) to forming an attitude toward the innovation,
3) to a decision to adopt or reject,
4) to implementation of the new idea, and
5) to confirmation of this decision."

Albirini (2006) expressed that research focusing on educational technologies are frequently centered around the first three phases of the process only due to the novelty of ICT in the education field. The author added that in the cases of most developing countries where technology is just brought into the educational system not long ago, studies have centered around the initial two phases namely the knowledge and the attitude toward the educational technologies. Rogers theory on innovation's diffusion process concerning individuals shift from acquisition of knowledge about the

technology to forming attitudes toward it and followed by its adoption or rejection and then decide whether to confirm the generally accepted belief that attitudes impact behaviour directly or indirectly (Ajzen & Fishbein, 1980; Zimbardo et al., 1977).

On the one hand, Albirini (2006) stated that by evaluating teachers' stages of adoption of technology permits the teacher to adapt the instruction to fit the learner's needs. On the other hand, various studies showed that teachers' positive attitude in dealing with the new technologies in school is one of the key components for successful implementation of ICT in the school (Liaw, 2002; Williams, 2015; Woodrow, 1992). This recommends that research at the early phases of integration of the new educational technologies in school should concentrate on users' attitudes toward using the educational technologies. In addition, Frog VLE implemented since 2012 and considered at the beginning of the implementation stages. Thus, based on DOI theory and this pressing need, the researcher aims to examine teachers' attitudes toward using Frog VLE in secondary public school in Klang district.

According to Rogers (2003), DOI is employed to study individual's innovation adoption and to provide a framework for better comprehension of the effect of technology on school systems. Previously, Rogers, (1995) mentioned that the characteristics of the technology itself greatly influences end user's attitude toward using a new technology. Lately, Rogers (2003) points out five basic features which are "relative advantage", "compatibility", "complexity", "observability", and "trialability" of technology that influences end user's acceptance and subsequent adoption of such innovation as well as a social norm. The definition of each technological characteristic are clearly stated as below:

1) "Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229).
2) "Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240).
3) "Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 257).
4) "Observability is the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258).
5) "Trialability is the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258).

Thus, in this study, a new virtual learning platform such as Frog VLE will be increasingly diffused if teachers perceive that the Frog VLE: (1) are beneficial to them and better than other ICT tools; (2) is compatible with their existing practices, (3) is easy to understand and use, (4) shows observable results, and (5) can be experimented with on a limited basis before adoption. As we know, implementation of educational technologies is a complex process involving many stakeholders with distinct roles and teachers play a critical roles in ensuring successful implementation of ICT in school (Gulbahar & Guven, 2008).

2.2.4 Attitude Models

There are many well-recognized models of attitude. In the section below, two relevant model will be discussed in details, namely, technology acceptance model (TAM) and tripartite model.

2.2.4.1 Technology Acceptance Model

The technology acceptance model (TAM) is developed by Davis, Bagozzi, & Warshaw (1989) based on the TRA. TAM has been applied widely in understanding behavioural issues about a person's actual and predicted use of ICT and has served as a theoretical framework in studies regarding the factors that influences a person's intention to use such as end-users' attitudes. Generally, TAM is a specific model derived from the TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and it is developed to explain and predict users' computer usage behaviour. However, TAM is different from TRA as it exclude subjective norm due to the insufficient to explain behavioural intentions and mostly due to methodological reasons (Davis et al., 1989).

TAM able to predict user acceptance by looking at the impact of user beliefs in terms of "perceived usefulness" (U) and "perceived ease of use" (E). U refers to "user's subjective perception of the extent to which a computer system will aid work performance" while E refers to "the extent in which the user expects the system to be easy to learn and use". Specifically, E is a measure of users' perceptions of how easy it is to carry out desired courses of actions using the system and U is a measure of outcome expectations for using ICT. A number of studies adopting different methodologies have found that both U and E affect user's attitude significantly and they are positively correlated with user's acceptance toward educational technologies (Lau & Woods, 2008). On the other hand, user's attitude and perceived usefulness toward the educational technologies predict user's behavioural intentions (BI) to use. Then, actual use of the educational technologies is predicted by BI. Technology Acceptance Model (TAM) is presented in Figure 2.5.

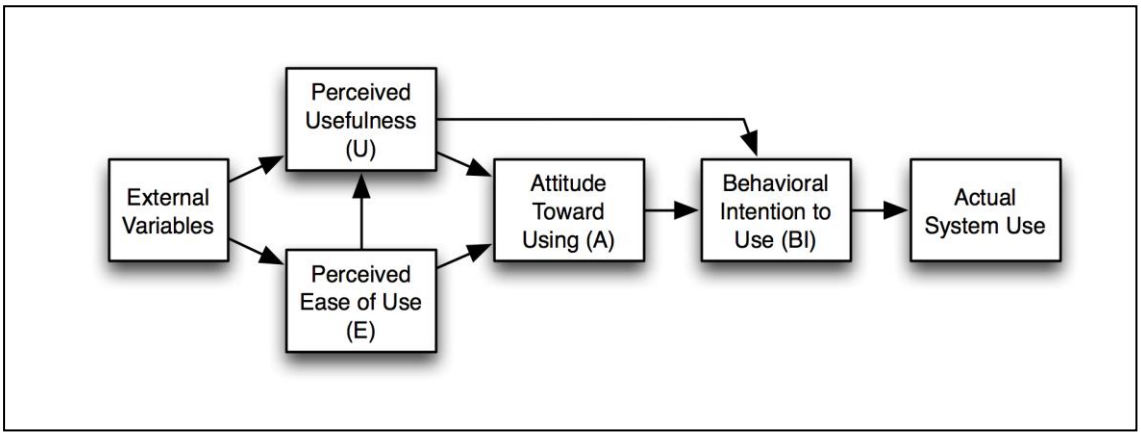

Figure 2.5: Technology Acceptance Model (Davis et al., 1989, p. 985)

Among the various theoretical models developed for research on technology adoption, the TAM model has emerged to be especially promising (Venkatesh, Davis, & Morris, 2007). In addition, many types of research on technology adoption prior to TAM examined user satisfaction and attitudes authors added. By using the TAM model, Porter & Donthu (2006) explained how Internet usage can be predicted by attitudes and the relationship between perceived access barriers and demographics. Statistical analysis of 539 cases in US showed that education, age, race and income are correlated with user's Internet beliefs and that these beliefs affect their attitudes toward Internet use. Results indicated that there is a significant and positive correlation between attitude toward Internet and Internet usage. In addition, Al-Gahtani (2011) documented that "perceived usefulness" and "perceived ease of use" are the key antecedent variables that having an impact on attitudes toward the ICT. As a conclusion, TAM model gives a excellent explanation of attitude toward using ICT (Porter & Donthu, 2006).

Besides, Yang & Yoo (2004) stated that earlier studies have confirmed the TAM model, however, the mediating effect of affective attitude on the relationship between cognitive attitude and information systems use is not clear. Hence, the authors expanded Davis's et al. (1989) TAM model by considering affective and cognitive dimensions of

attitude and the hypothesized internal hierarchy among beliefs, cognitive attitude, affective attitude and information systems use. The authors realized that it is important to look into cognitive attitude if researchers will to explain individuals' information systems usage behaviour however it is not clear regarding the use of affective attitude construct in explaining information systems use. Based on the results, the authors mentioned that it is critical for research in educational technologies to focus on users' attitudes as it might have an impact on the overall usage of the technology. Hence, there is a need to study explicitly end user's attitude toward using the ICT in technology adoption research.

2.2.4.2 Tripartite Model

Historically, tripartite model of attitudes consist of cognitive, affective, and behavioural components (Bagozzi, Tybout, Craig, & Sternthal, 1979; Fishbein & Ajzen, 1975; Ostrom, 1969; Rosenberg, 1960; Zimbardo et al., 1977). Dalege et al. (2016) mentioned that there is a need for any formal measurement model of attitudes to meet the two fundamental criteria. Firstly, the model must relate between the multiple responses on an attitude questionnaire and the attitude construct. Secondly, it must provide an explanation of the correlations among these multiple responses. The authors noted that the tripartite model of attitudes is the most influential model of attitudes that meet these two fundamental criteria. Dalege et al. (2016) summarize that current theorizing on the relationship between affect, cognition and behaviour and attitudes and indicated that the relationship between them is recursive. It means affect, cognition and behaviour predict attitudes and that attitude also have an impact on affect, cognition and behaviour.

Schematic representation of the three-component view of attitude by Rosenberg (1960) is as shown in Figure 2.6. All responses to a stimulus object are mediated by the person's attitude toward that object. The differences responses, however, are classified into three categories: affective (sympathetic nervous responses and verbal statements of affect), cognitive (perceptual responses and verbal statements of belief) and behavioural or conative (overt actions and verbal statements concerning bahavior). Figure 2.6 also implies that a complete description of attitude requires all three components be assessed by obtaining measures of all three response classes. Ajzen & Fishbein (1980) mentioned that measures of attitude based on only one or two response classes are incomplete and that use of such incomplete measures to predict overt behaviour does not represent a fair test of the relation between attitude and behaviour. It was explained by arguing that most measures of attitude merely assess the affective component.

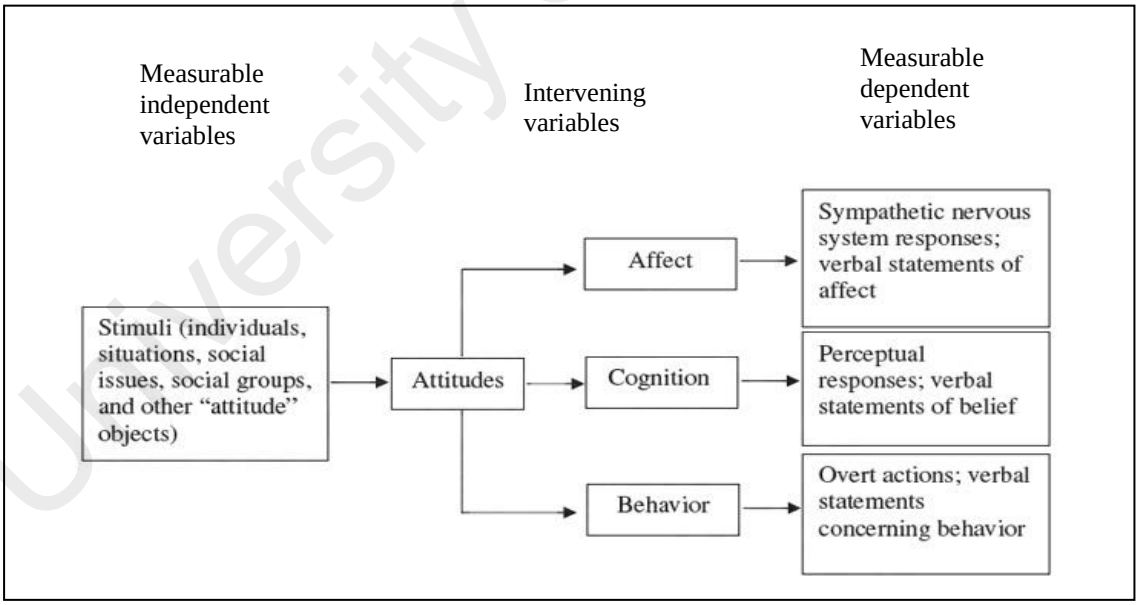

Figure 2.6: Three Component View of Attitude (Rosenberg, 1960 as cited in Ajzen, 1985, p. 19)

Jain (2014) examined the numerous models of attitude and inspects the three critical components of attitude in an attempt to propose a theoretical model within which

attitude components could be examined with their interrelationship to form various attitudes. Jain (2014) states "attitude represents the positive or negative mental and neural readiness toward a person, place, thing or event. It consists of three components, namely: affective component, cognitive component and behavioural component" (p. 6). Affective component is the emotional response (liking/disliking) toward an attitude object; cognitive component is an evaluation of the entity that constitutes an individual's opinion (belief/disbelief) about the object and lastly behavioural component is a tendency by an individual and it consists of actions or observable responses that are the result of an attitude object. Therefore, attitude includes of what individuals feel (affective), believe (cognitive), and plan to do (behavioural). This is further supported by Liaw et al. (2007) stated that attitudes toward virtual learning environment could be learned from different aspects, for example, affective, cognitive, behavioural, and social components.

With regards to technology integration, attitudes of the teacher toward technology may be conceptualized as how they feel (affective), what they believe (cognitive), and plan to do (behavioural) with the technology (Jain, 2014). Thus, in this study, the researcher made assumptions that those who believe that the utilization of Frog VLE will benefit them, feel that Frog VLE is good, and have the intention to utilize Frog VLE tend to have a positive attitude toward such virtual learning environment and have a higher possibility to use them. Table 2.1 showed the breakdown of the three components of attitude conceptualized by researcher in this study.

Table 2.1: Breakdown of the three components of attitude

Components		
Affective	Neural	Feeling/ Emotion
Cognitive	Mental	Belief/ Evaluation
Behavioural	Readiness	Response/ Action

2.3 Related Literature and Previous Research

Researcher focused and discussed on the related literature reviews and empirical studies pertaining the variables used in this study. This study investigates teachers' attitudes toward using the Frog VLE (dependent variable) in relation to principals' e-leadership practices (independent variable) and computer-mediated communication competence and school virtual learning culture as mediating variables with teachers' demographic variable as moderating variable. Researcher reviewed critically these five variables to give readers a clearer picture regarding the related dimensions and constructs that should be included in each of these latent variables before the construction of the measurement models.

2.3.1 Teachers' attitudes toward using the Frog VLE (Independent variable)

Oxford online advanced learner's dictionary defined the word "attitude" as "the way that you think and feel about somebody/something; the way that you behave toward somebody/something that shows how you think and feels". Zimbardo et al. (1977) stated that attitude is regarded as mental readiness that exerts some broad impact on a genuinely huge class of evaluation responses. "An attitude is a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6). Hence, how an individual reacts to his/her surroundings is called his/her attitude. Psychologists such as Rosenberg (1960), Zimbardo et al. (1977) and Ajzen & Fishbein (1980), have defined attitude in terms of components, namely, affective (feelings toward the attitude object), cognitive (beliefs regarding the attitude object) and behavioural (responds toward the attitude object).

According to Kay (1993b), it is not easy to select constructs from the computer attitude knowledge bank without theoretical sustenance. By referring up-to-date

theorizing in the field of attitudes, it allows us to explain this psychological construct. Hence, through an extensive review of theoretical and empirical data and analyze the theoretical foundations of general attitude measurement, Kay (1993b) develop an instrument for computer attitudes. Retrospective, the most popular instrument to measure attitude was known as the tripartite model of attitudes, which consist of affective, behavioural and cognitive components (Dalege et al., 2016). These models have been used extensively since 1960 (Ajzen & Fishbein, 1980; Rosenberg, 1960; Zimbardo et al., 1977).

In the year 1989, Kay used a multi-component model which consist of both affective and cognitive attitudes toward the computer. Later, a third subscale which assesses the behavioural component is added after Ajzen & Fishbein (1980) argued that cognitive and affective attitudes are not sufficient in predicting behavior and suggested that the social desirability of a specific behaviour should be included. Finally, "Computer Attitude Measure" (CAM) consisted of demographic characteristics of respondents, cognitive, affective, and behavioural attitudes. Data collected from 383 students demonstrated that there are significant positive correlations ($p < .001$) of all constructs with a high degree of experiences and computer literacy. Besides, CAM showed a very good level of internal reliability with cronbach's alpha of cognitive ($\alpha = .87$); affective ($\alpha = .89$) and behavioural ($\alpha = .94$) greater than .85 for all the three constructs.

Later in the year 1993, Kay constructed the Computer Attitude Measure (CAM) once again but there is one extra component included to examine four different components of attitude assessment, namely: affective, cognitive, behavioural and perceived control. By referring to the four constructs of extensive attitude studies, the researcher aims to examine an alternative computer attitude measure and to study the impact of the context

within the framework across Ontario province. Results collected from 647 pre-service teachers selected from four universities across Ontario province indicated that positive attitude and computer ability are significantly correlated with each other.

Attitude as for quite some time been identified as a caused of intention in accepting or using ICT (Lu, Yu, Liu, & Yao, 2003). Through reviewing relevant literature, it was found that teachers' attitude toward ICT play a significantly important role in affecting the successful implementation of ICT in schools (Celep & Tülübaş, 2014; Hew & Brush, 2007). According to Pynoo et al. (2011), it is important to know what factors cause the teachers to accept and utilize new ICT tools. In the year 2004, Bullock found that one of the major enabling and disabling factors of teachers' ability to use the technology is teachers' attitude. Besides, Liaw et al. (2007) noted that one of the major obstacles that affect the utilization of ICT tools is individual attitudes. This finding is further supported by Gulbahar & Guven (2008), their study indicates that teachers' attitude is the key determinants of the success of educational technology innovation.

Besides, Mumtaz (2000) believed that school factors such as essential technical support and the positive attitude of the principal do influence the utilization of technology in school. Nonetheless, teacher factors such as beliefs, skills, and attitudes outweighed the school factors in explaining teachers' use of computers. The author added that schools can go just so far to support utilization of computer, however, the actual utilization of technology in school depends to a great extent on teachers' skills and attitudes toward using the ICT. Regardless of how advanced and how sophisticated the technology, its successful implementation relies on end-users having a positive attitude toward it (Liaw, 2002). Therefore, teachers' attitudes are critical in initiating the

use of ICT in school's program and to effectively integrate technology in school (Celep & Tülübaş, 2014).

As we know, teachers' and student's positive attitude toward the utilization of ICT is essentials in order for them to accept and integrate ICT into schools (Williams, 2015). However, knowing that one of the prerequisites for ICT implementation is end users' attitude, still, Mohammed I (2003) noted that among the few researchers examining computer use mainly focused on its effect on student's achievement. In addition, Gulbahar & Guven (2008) states "much of the early research on the computer uses in education has overlooked the psychological and contextual factors involved in the process of educational computerization" (p. 45). Studies mainly focused on utilization of technology and its effect on teachers' competency. Hence, it is important to examine teachers' attitudes toward using the ICT. As we know, in order to implement ICT effectively in school, it depends greatly on teachers' attitudes that eventually decide how they are utilized as part of the school.

In 2004, Zain, Atan, & Idrus carried out a study across Malaysian Smart Schools to find out the effect of ICT on their management practices. Their findings indicated that untrained staff unwillingness to support and accept the ICT is among the challenges encountered by the schools. In addition, there are quite a number of research indicates that positive attitudes are anticipated that would encourage computer integration in any academic endeavour (Mumtaz, 2000; van Braak et al., 2004; Williams, 2015; Woodrow, 1992) and negative attitudes make accomplishment of competency less feasible (Yildirim, 2000). Furthermore, Zimbardo et al. (1977) states "even though we cannot predict the behaviour of single individuals, we should be able to predict that people (in general) will change their behaviour if we can change their attitudes. . ." (p. 52).

Zimbardo et al. (1977) also stated that it is possible to change individual's behaviour once their attitudes have been identified. Hence, the researcher noted that there is a need to carry out a study to examine explicitly teachers' attitudes toward using the Frog VLE in this study and to fills an important void in the teachers' attitude literature in Malaysia context.

Ahmad Fauzi, Kamariah, & Rohayati (2014) carried a study on total samples of 187 mathematics teachers from Selangor, Malaysia through stratified cluster sampling method. The study focuses on investigating the factors that affect mathematic teachers' attitudes toward using ICT in the classroom. Five factors such as school support, school culture, teachers' technology competence, accessibility to ICT and teaching experience were hypothesized to affect teachers' attitudes toward the implementation of ICT in the classroom. Results indicated that school support [$r = .366$; $p < .01$], school culture [$r = .261$; $p < .01$], teachers' technology competence [$r = .41$; $p < .01$], accessibility to ICT [$r = .220$; $p < .01$] had significant effect on teachers' attitudes toward using ICT in the classroom. However, a negative relationship existed between teaching experiences and teacher' attitudes toward using ICT in the classroom [$r = -0.192$; $p < .01$]. Besides, multiple regression analysis showed that school support, school culture and teachers' technology competence contributed to 29.1% of the variation in attitudes of teachers toward using ICT in the classroom.

Positive attitudes of teachers toward ICT is important if ICT are to be successfully coordinated into the classroom and the school curriculum (Mojgan, Kamariah, Wong, Bahaman, & Foo, 2009; Teo, 2008). This is supported by Harrison & Rainer (1992) stated that those with positive attitudes are more likely to accept and use the computer as compared to those possess negative computer attitudes because negative attitudes

will cause individuals to be less skillful in computer use. According to Huang & Liaw (2005), teachers' acceptance and integration of technology in teaching are affected by teachers' attitudes toward ICT. Liaw & Huang (2003) stated that understanding end-users' attitudes toward ICT are one of the ways to help teachers create appropriate VLE for teaching and learning. The authors focused on developing a conceptual model regarding individual perceptions toward using Internet search engines as a tool to search for information. The model study individual's attitudes toward search engines from a new perspective that included the quality of the search system, users' perceptions, motivation, computer experience and technology acceptance. The study was conducted in a medical college in central Taiwan with a sample of 120 students. However, out of 120 samples, researchers only able to collect back 114 questionnaires (80 male; 34 female). Results indicated that the quality of search systems and individual's motivation, computer experience and perceptions toward technology acceptance had a significant effect on individual feelings to search information using search engines. Thus, the study helps to gain a richer understanding of both experience and perceptions that would influence the use of search engines of a person.

McCarthy (1998) stated that negative teachers' attitudes resist them from learning to use computers and at the same times affect their acceptance and willingness to utilize the technology. This is further supported by Omoogun, Ephraim, & Omoogun (2013) indicated that the negligence of end-users attitudes may lead to failure of many past educational reforms. In addition, no matter how advance the ICT is, Baylor & Ritchie (2002) mentioned that only with necessary skills, knowledge and positive attitude, end-users will use the technology. Yildirim (2000) documented that "teachers teach as they have been taught, it is unlikely that computer skills will be transferred to students and encouraged by teachers unless the teachers have positive attitudes toward computer use"

(p.481). Therefore, if teachers want to utilize Frog VLE effectively, they have to be positive where such positive attitude is developed when they are pleased with the ICT and are proficient on its utilization (Mojgan et al., 2009).

Besides that, Demirci (2009) collected data in 55 high schools across 33 separate Turkey's provinces using a questionnaire to examine the extent of the diffusion of Geographic Information systems (GIS) throughout geography lessons by focusing on teachers attitudes toward the GIS usage. 79 geography teachers responded to the questionnaire. Findings revealed that teachers' positive attitude toward GIS is a significant determinant which contributes to the effective implementation of GIS into future geography lessons in Turkey. Thus, effective and efficient use of ICT in schools will only occur if teachers are happy and comfortable in using the ICT tools. As such, the attitude of teachers plays a significant role in achieving a 21st-century school (Sujo-Montes & Gallagher, 2011).

Additionally, Liaw (2002) aim to study the relationship between computer attitudes and Web attitudes, to examine the distinctions of demographic factors and to find the indicator factors on practitioners' attitudes toward computer and web. According to Liaw's (2002), there are three main measurements namely affective, cognitive, and behavioural in developing practitioners' attitudes toward ICT. Both affective and cognitive measurements positively affect the behavioural measurement. 809 students from Seattle Pacific University participated in the online survey and only 260 students gave back their completed survey through the Internet. The response rate was 32.5%. Results demonstrated that student's computer attitudes and Web attitudes are positively correlated and could provide concurrent validity to one another. Besides, findings demonstrated that male student and those who are more experienced in using a

computer are more likely to have positive perceptions toward ICT. Hence, it is important to examine teachers' own perception of their attitudes toward using Frog VLE as part of this study because how teachers perceive about ICT is similarly as critical as access to the ICT itself because the thinking process will eventually administer the choices that the teachers made (Sujo-Montes & Gallagher, 2011).

In line with these findings, another study carried out by Albirini (2006) to explore the English Foreign Language (EFL) teachers' attitude toward ICT in Syria high school. Findings indicated that teachers' positive attitude toward ICT is the key components for appropriate technology use in school. Teachers' positive attitudes toward technology is the key element for ensuring successful integration of ICT in school as well as avoiding teachers' imperviousness to ICT use (Albirini, 2006; Gulbahar & Guven, 2008). In the study, teachers' attitudes toward technology had been predicted in terms of cultural perceptions, computer attributes, and competencies. Albirini (2006) suggested that cultural conditions of a school, teachers' vision of ICT and experiences with ICT are very important in shaping teachers' attitudes toward ICT and its subsequent utilization in teaching and learning process.

In addition, Yildirim (2000) aim to investigate the factors that lead to the utilization of computer among pre-service and in-service high school teachers and their attitudes toward computer. Data collected from 114 pre-service and in-service high school teachers from a university in southern California stated that their attitudes in terms of "anxiety", "confidence" and "liking" showed a significant improvement after the computer literacy course. It shows that their existed computer experience shaped their expectations of the course. Besides, professor's willingness to teach is one of the factors that impacted their attitudes toward computers and its utilization.

More recently, Saltan (2015) aims to evaluate teachers' attitudes toward Information Technology Mentor Teachers. The author added that perception of teachers is very important because ICT support plays an influential role in shaping teachers' positive attitudes toward technology and also successful implementation of technology in curriculum. Thus, an instrument with 21 items is build to measure teacher attitude toward Information Technology Mentor Teachers by considering related literature, expert opinions, and interview results. Convenient sampling method was utilized and 40 teachers (27 female; 13 male) from a primary school in Ankara choose to participate in the pilot study. Based upon the factor and reliability analysis, a final instrument with 17 items which comprised of three factors (confidence, willingness, and efficacy) is build to evaluate teachers' attitudes toward Information Technology Mentor Teachers. The Coefficient alpha values for each subscale were in the range of .80 to .88.

As ICT turns out to be more critical in education, teachers' attitudes toward their use may play a vital part in helping schools to effectively integrate ICT into the school curriculum. In 2008, Teo conducted a survey in Singapore by using a set of questionnaire to examine 139 pre-service teachers' attitude toward the computer usage. The questionnaire to assess teachers attitude are divided into four factors which are "perceived usefulness", "affect", "perceived control", and "behavioural intention" to the computer usage. The results indicated that the teachers held a positive attitude toward the computer usage. He also found out that gaining information about teachers' attitude may provide useful insights into their ICT usage in teaching and learning. Further supported by Christensen (2002), the author stated that when teachers possess positive attitudes toward computers, students will have positive perceptions of computers as well. So, at the point when teachers' attitudes are positive and they are certain toward the

utilization of educational innovation, they can easily adopt and integrate ICT into their classroom.

Furthermore, technological advancement has put on greater pressure on the shoulder of teachers to engage with various types of technology tools in preparing, delivering and conceptualizing their ways of instruction (Teo, 2015). However, in the year 2007, Liaw et al. noted that there is a limited empirical study on instructor's and learner's attitudes toward VLE. Thus, the authors decided to examine their attitudes from the social perspectives, affective, cognitive and behavioural perspectives toward e-learning usage. Two sets of questionnaire survey were distributed to 30 instructors and 168 college students for examining their perceptions. Findings demonstrated that instructors have exceptionally positive perceptions toward using VLE as a teaching assisted tool. Furthermore, perceived usefulness and self-efficacy impacted instructor's behavioural intention. With respect to learner's attitude, self-paced, teacher-led, and multimedia instruction are major factors that impact their attitudes toward VLE as a compelling learning tool. Authors end the writing by proposing guidelines for establishing VLE based on the findings obtained.

Based on Drent & Meelissen (2008) study on investigating the factors which impact the usage of technology by 210 teachers in the Netherlands, findings demonstrated that: "student–oriented pedagogical approach", "positive attitude toward computers", "computer experience", and "personal entrepreneurship" of the teacher have a significant positive impact on the innovative use of technology by the teacher. However, not all studies had similar findings, contrarily, Teo (2009) conducted survey research on 442 preservice teachers at the teacher training institute of Singapore. The mean age of these participants was 23.1 years, 74.1% were female, and everyone volunteered to

participate. The researcher employed TAM as the theoretical framework of his study to examine whether attitudes influenced the participants' intent to use technology. After statistical analysis, the results demonstrate that attitudes did not significantly impact the participant's intent to use technology.

Based on above literature review, the researcher found that there is inconsistency of results obtained for teachers' attitude toward using technology. Hence, there is a need to explore more on this area. In addition, Venkatesh et al. (2007) documented that "study of key antecedents and various interventions are key indicators of scientific progress and practical applicability of technology adoption research as it deepens our understanding of the phenomenon and provides levers for managerial action" (p. 270). Therefore, this study could be considered as a new intervention which principals' e-leadership practices is proposed as a new antecedent to teachers' attitudes toward using Frog VLE.

Attitudes are open to change and can be influenced by educators (Florin, Karri, & Rossiter, 2007). However, according to Cox, Preston, & Cox (2000)**,** if teachers see no need to change, they will not use ICT or computer in the classroom or carry out their daily routine work through social networking sites. Teachers need to understand that technologies will benefit them in order to use the technology tools (Becta, 2004)**.** In other words, introducing new technology tools or social networking sites is not sufficient to promote action. Teachers need to perceive that the application of the new technologies is feasible and that a virtual learning environment is desirable.

In addition, in 1989, Davis notes "most subjective measures used in practice are invalidated, and their relationship to system usage is unknown" (p. 319). Thus, the

author constructed and validated new measurement which hypothesized perceived usefulness and perceived ease of use as the major determinants of end-user acceptance. Samples consisted of 152 industrial users of four application programs. Results showed that usefulness and ease of use have an impact on usage. Perceived usefulness to be more influential as compared to ease of use and shows significantly greater correlation with usage behaviour. Besides, perceived usefulness strongly influenced intentions and intentions to adopt technologies were significantly correlated with usage. Thus, the researcher predicts that there is a need for end-users to possess positive perception or attitude regarding the usefulness of technologies in order to have good intentions to adopt the technologies. Moreover, Voogt (2010) realized that teachers who utilize ICT widely in their classroom are more engaged in professional development programs and more confidence with their pedagogical ICT skills. They pay attention on student-centered approach and they are more collaborative as compared to those who seldom use ICT. Hence, an emphasis on inculcating a positive attitude toward using Frog VLE appears to be central to Frog VLE usage.

As mentioned earlier, Ajzen & Fishbein (1980) claimed that a multi-component model that include the evaluation of social desirability of a specific behaviour able to enhance the predictive value of an attitude measure. Thus, based on this viewpoint, in this study, researcher includes the behavioural desirability of using Frog VLE behaviours in the questionnaire. Specifically, the researcher investigates the levels of teachers' attitudes toward using Frog VLE in public secondary school in Klang district based on the tripartite model of attitudes which comprises of affective, cognitive and behavioural components. In addition, Liaw et al. (2007) expressed that attention to these affective, cognitive, behavioural perspectives would serve as an ideal beginning to further the understanding of the role of attitude factors in VLE usage. Also in

accordance with Ajzen & Fishbein's (1980) theory of reasoned action, the target (Frog VLE) and the action (using the Frog VLE) of a particular belief are maintained constant for all items in the teachers' attitude toward using Frog VLE questionnaire. In other words, affective, cognitive, and behavioural attitudes all refer to the same action and target, namely, "use of Frog VLE".

In particular, this study focus on the tripartite attitude model which proposed that teachers' attitude toward using Frog VLE can be encouraged by influencing feelings, beliefs and behavioural intentions toward an attitude object (Rosenberg, 1960). According to attitude theory, attitude refers to how an individual responds to an attitude object. Florin et al. (2007) described that a valid measurement for attitude must refers to a specific attitude object. Thus, researcher extends this research stream by identifying and measuring attitudes toward using Frog VLE that may foster teachers' intentions to increase the usage of Frog VLE in carrying out their daily practices.

Similarly, Liaw et al. (2007) mentioned that a single linear methodology is not sufficient for evaluation of VLE. a good instrument of VLE should include different aspects of user perceptions (Wang, 2003). In other words, Wang (2003) suggested that a multidisciplinary approach is critical in order to examine attitudes of a person toward VLE. In light of Liaw (2002) perspective, end user's attitudes toward ICT can be measured through three noteworthy perspectives which are affective, cognitive, and behavioural. Thus, in this study, researcher used tripartite model of attitudes as its primary theoretical understanding on the teachers' attitude toward using Frog VLE in Klang district secondary schools with the justification that tripartite model showed highest predictive ability to explain end-users attitude (Florin et al., 2007).

2.3.2 Principals' E-Leadership (Independent variable)

Google reports 1,600,000 hits under the title "principal leadership" as opposed to 3,800,000 hits for the title "principal e-leadership" (search being conducted on June 8, 2015). In fact, the migration of leadership to e-leadership has been considered a decisive factor in shielding any reform endeavors (Avolio & Kahai, 2003). Mishra et al. (2016) stated that research on e-leadership mainly focuses on business and non-educational area. Furthermore, Lovelace (2015) noted that there is relatively limited current literature on e-leadership that specifically introduced the concept of e-leadership via an empirical study and mainly focuses on anecdotal evidence. Thus, the introduction of e-leadership to the educational settings will be significant for a study on e-leadership to examine the differences in non-educational settings (Gurr, 2004). For instances, Carreño (2009) study focused on the use of ICT in educational settings, specifically, e-mentoring between virtual leader and mentor. The author highlights the main strengths and skills needed by effective e-leaders and their significance in the virtual setting to manage the education effectively. In addition, Jameson (2013) noted that e-leadership is scarcely distinguished as a critical component of higher institutions. Therefore, it is critical that leaders from all levels including those from management and teacher level to be personally more focused on e-leadership as a strategic.

In year 2012, Lam & Woodhead compared two case schools across eight different areas of e-leadership namely: "leadership and management", "curriculum", "learning and teaching", "assessment", "professional development", "extending opportunities for learning", "resources" and "impact on student outcome". The authors concluded that introduction of ICT had revealed the underlying values and beliefs about the impact of technology on the leadership of learning. Besides, it is also important to addressed e-leadership issues regarding learning with ICT, use of digital learning networks and the

implications of leadership at all levels from principal to classroom leaders. Lam & Woodhead's (2012) findings highlighted the significance of school leadership and it is further supported by Bierly, Doyle, & Smith (2016). They showed that a full 96% of respondents agree that great leadership is an essential ingredient in making a school successful and a full 92% of respondents agree that great leadership can significantly improve results of high-needs schools in their report.

On the one hand, in order to investigate students' perception on the change of e-leadership style (transactional and transformational leadership styles) and its impact in the virtual context in Taiwan, Fan (2013) adopted a 2x2x2 factorial experiment design through administration of survey questionnaires to a total of 130 undergraduate students. Findings revealed that in an assigned situation, students' perception on the change of e-leadership style (transactional and transformational leadership styles) was stronger. Additionally, the authors added that virtual leaders should guide their team members with more expressive wordings to show concern and understanding through computer-mediated environment. As these would earn others respect and trust and at the mean time increase members' willingness to propose their ideas.

On the other hand, Blau & Presser (2013) in their study to investigate school leaders' e-leadership in enhancing school effectiveness through school data management system. The authors stated that school leaders should delegate e-leadership responsibilities to enhance principals' e-leadership practices in school. The authors concluded that the effective integration of the school data management system facilitates school leaders' and teachers' e-leadership practices, and hence enhance their school effectiveness. Besides, successful e-leaders that successfully implement the school data management system are those who able to make a data-driven decision; to monitor curriculum

implementation, learning performance and student activity; to have e-communication with teachers, students and parents; to delegate responsibilities; and to improve the school environment.

In Malaysia context, by referring to the theory of three levels of product attributes, consequences and personal values that are hierarchically interconnected, Mohd Yusri (2014) intend to build a model of e-leadership, intra-team communication and job satisfaction among the school principals. Statistical analysis indicated that the e-leadership significantly affected intra-team communication and intra-team communication influenced job satisfaction significantly. In 2015, Mohd Yusri published another article on the model of e-leadership, intra-team communication and job performances among school leaders in Malaysia. Results indicated that a successful model of e- leadership that can be practiced by school leaders in parallel with the rapid development of mobile technology has been developed.

With the aims to provide the country with information to strive in the 21st century, Hanna (2007) discuss the strategic issues in designing e-institutions for both government and private sectors in a report written for World Bank study of e-leadership. The author stated that e-leadership institutions should have the capacity to carry out various essential functions such as: "(i) e-strategy formulation including integrating national ICT strategies into overall development strategies; (ii) policy, legal and regulatory frameworks; (iii) program implementation, coordination and partnership; (iv) resource mobilization and allocation; (v) promotion of connectivity, digital literacy, and economy-wide diffusion; and (vi) strategic communications, monitoring and evaluation" (p. 10).

In addition, Fullan (2003) showed that without school principals' support, it would be difficult to successfully change or reform the school in large scale. Likewise, Schiller (2003) indicated that school leaders are the main determinant in ensuring successful change in schools and the potential of ICT can only be realized through the support of school principals. In his survey studies of all elementary and secondary principals in government, Catholic and independent schools in the coastal Hunter region of New South Wales, Australia, Schiller (2003) found that quite a number of school leaders in Australia now realize their roles as a leader in encouraging the usage of ICT in schools. Besides, findings revealed that those who adopt a dynamic strategy to ICT are able to cultivate an environment that has more noteworthy advantages for their staff and student. The author concluded the paper by calling for more research in order to clearly identify the critical role of the school leaders to implement ICT in school successfully.

As we now know, school principals facing difficulties on how to maximize and assessing ICT usage in their schools in this technology-rich environment (Waxman, Boriack, Lee, & MacNeil, 2013). Undeniable, Internet and ICT have changed the way we work and live today in many aspects (Lim et al., 2013; Mishra et al., 2016). Mishra et al. (2016) argued that the integration of advanced ICT into education are capable of altering how school leaders work and how a school function especially when schools act as complex ecologies and dynamic organizations. "Principals must be able to integrate ICT into their daily practice and to provide consistent and positive leadership for technology use in the teaching-learning process. In fact, they must be technology leaders" (Arokiasamy, Abdul Ghani Kanesan, & Aziah, 2014, p. 28). Crucial investigation of the relationship amongst leadership and technology has been call upon the visions of the future where leaders would have the capacity to convey, work together, and telecommute with employers from all over the world (Mishra et al., 2016).

Further supported by Chang, Chin, & Hsu (2008), they found out that principals' technology leadership is essential for successful implementation if ICT in school and it is significantly correlated with teachers' integration of ICT.

Besides that, Sohawon, Panday, & Baxou (2015) study focused on how principals' leadership style and potential to put all the resources together to successfully implement ICT in schools. The authors indicated that distributed leadership model where the school teachers are collaborative and participate in the process of ICT policy planning at school probably is the most preferred mode of leadership to successfully implement ICT in schools. Indeed, school principals need to have an ICT plan and raise awareness among teachers on school vision on how to integrate ICT in schools. Results revealed strong perceptions of teachers on the need of school leadership to guide them in the process of ICT integration in school. In addition, teachers' interview shows that in situation where teachers realize the possibility of ICT to help them with the school work should the implementation of ICT in school be preferably integrated. From the findings, it shows that principal should communicate school vision clearly to the teachers and principal leadership and support is very much needed in order to successfully implement ICT in school.

Similarly, Gronow (2007) indicated that one of the responsibilities of a school leader is to integrate technology into schools. On the other hand, Sujo-Montes & Gallagher (2011) stated that effective use of ICT for learning, discovery, and teaching 21st century skills will soon become a marker of good principals and administrators. For instance, Wang, Gurr, & Drysdale (2016) found that four school principals from Singapore that involved in their study play a very critical role in ensuring the success of their school. Their successful leadership practices were guided by their own values, beliefs and

qualities. In addition, evidence supported that when principals act as technology leaders in school, then teachers can integrate ICT more effectively and increase the usage of ICT in school (Waxman et al., 2013).

Next, Kearsley & Lynch (1994) discussed the potential advantages of great technology leadership are to "improve academic achievement by students; improve student attendance and reduced attrition; provides better vocational preparation of students; allow more efficient administrative operations and reduced teacher/staff burnout and turnover" (p. 10). From this point of view, in this study, researcher assumed that principals' e-leadership practices and the role of instructional technology have become significantly important in the educational system as ICT are widely used in the school context. However, Gryzelius (2015) documented that the usage of ICT tools in Malaysian schools context remains inefficient and school leaders need to bear some responsibility for enhancing the usage of ICT tools and increase the productivity of administrative operations. Gryzelius (2015) states "ICT usage in Malaysian schools remains exceedingly low, with the 2013 Auditor General report finding that less than 5 percent of Malaysian teachers make daily use of the ICT facilities provided" (p. 1). Additionally, the author added that one of the factors that lead to minimal usage of ICT by teachers is due to the minimal involvement of school leadership when implementing ICT policies into their schools. Thus, it can be concluded that school principal play a significantly important role in helping the school to implement ICT and leading schools to use ICT effectively.

Ng (2008) written an article on the Singapore Leaders in Education Programme entitled "Developing forward-looking and innovative school leaders: The Singapore Leaders in Education Programme". By using the open-ended approach, the author

collected feedback from 48 participants that participated in the Future School Project that was introduced in the Leaders in Education Programme in 2004. One of the ideas generated from the Future School Project is regarding the important role of virtual classrooms through the e-learning platform that serving both local and international students. In addition, the author discussed the critical role of school leadership in transforming schools and stated that school principals are engaged in work that is difficult and complex. Thus, a school principal must be able to wisely select and adopt good principles to the school context to bring actual benefits to the school.

Furthermore, Adu & Olatundun (2013) stated that ICT are able to enhance the quality and openness of education, student's learning motivation, student's learning environment and the scholastic performance. Learning through ICT is much more effective than traditional chalk and talk in the classroom where the teacher just teach in front of the classroom and the student just listens by sitting down with minimal interaction between them. Despite the many advantages of virtual learning platform, still many school leaders are facing a range of difficult management issues. Thus, they need to upgrade and refine their technology skills (Adu & Olatundun, 2013). The authors suggested 6 strategies such as: develop a school ICT policy; learn the technology; involved others in the process; enhancing partnership and collaboration; plan a training program for teachers and benchmarking other schools for school principals to manage school technology.

According to Vázquez Cano (2013), principals' e-leadership roles have been investigated as a method for improving student achievement and supporting the implementation of ICT into schools. As documented by the author, e-leadership requires new forms and structures that are more open and collaborative. In other words, school

principals should be collaborative with teachers and help teachers to engage their students with the use of ICT in this new millennium. Nevertheless, if leadership does not provide a clear direction, creates inconsistencies and shows a lack of concern for employees then the leadership system may drag down the organization (Avolio & Kahai, 2003). Hence, school principals need to have certain skills, knowledge and alert with up to date technology in order to help teachers integrate technology and understand the use of technology (Waxman et al., 2013). However, the authors identified that numerous school principals are still in the process of learning and have limited training or experience in the knowledge and skills that required being a successful e-leader. Thus, it is the interest of researcher to investigate the level of Klang district school principals' e-leadership practices.

Lim et al. (2013) looking at schools as an organization like any ecosystem which has the tendency or ability to maintain internal equilibrium. Similarly, Mishra et al. (2016) looking at schools as complex ecologies. The authors documented that technology can affect and change leadership in three different ways, namely: "replacement", "amplification", and "transformation". Authors suggested applying the "Replacement, Amplification, and Transformation" model to models the e-leadership for a better understanding of these complex processes of technology infusion.

Mishra et al. (2016) states "current work on organizations has indicated that the effects of technology are not determined by the technology itself, but rather that it occurs within a reciprocal relationship between the technology and the organization (in terms of its culture, structure, approach, context and more)" (p.250). Thus, in this study, the researcher aims to conceptualized e-leadership practices of school principals based on the context in daily public secondary schools in Klang district. Building on the work

of Jameson (2013) regarding the e-Leadership framework for educational technology in higher education, the researcher aims to investigate the association between principals' e-leadership practices and teachers' attitudes toward using the Frog VLE in secondary level public schools in Klang district. This is further supported by Avolio et al. (2000), authors stated that in studying e-leadership the context is very important, but the construct being studied is important as well. Thus, it is crucial to study e-leadership practices in the context of Malaysian schools for a better understanding of the construct. In addition, Khawaj (2009) noted that there is no even one internationally e-leadership model that applies for all. This is because new paradigm of leadership will be distinct in different country and sector with a different culture.

Research has revealed a lack of e-leadership training programs addressed to small and medium-sized enterprises including higher education, training providers and online and blended learning providers (Korte & Husing, 2015). In addition, the authors realized that there is not sufficient portfolio of solutions to address the need for providing e-leadership skills in an integrated, well recognized and accredited format. Thus, by referring to Jameson (2013) e-leadership framework and grounded on the theory of Transformational Leadership Theory (Leithwood, 2004; 2006), in this study, the researcher aims to investigate principals' e-leadership practices in secondary public school in Klang district.

2.3.3 Teachers' Computer-mediated Communication Competence (Mediating Variable)

According to Zlatić, Bjekić, Marinković, & Bojović (2014), teacher communication competence has been one of the most important content for teacher training programs and it is an essential competence of teachers. However, the studies on effects of teacher

communication competence have not been investigated systematically and there is no specific comparison between students-teachers and active teachers' communication competence. Thus, Zlatić et al. (2014) indicated that there is need to investigate the teachers' and students- teachers' communication skills and their competencies.

The task to define communication competence is not easy and the definitions of communication competence vary widely. Spitzberg & Cupach (1984) defined communication competence as an individual's ability to choose communication behaviour which is suitable to achieve the aim of the social relation. Zlatić et al. (2014) defined communication competence as "a system of knowledge, skills, abilities, motivational disposition, attitudes and properties in teaching communication and social interaction" (p. 606). Despite many different definitions conceptualized by researcher in different field, in the education field, researchers come to the consensus that teachers' communication competence made up of motivation, knowledge, skills, behaviour and attitudes (Bakic-Tomic, Dvorski, & Kirinic, 2015).

In the year 2015, Bakic-Tomic et al. examine the different aspects of communication competence among primary education teachers in Croatia using survey questionnaire. The authors aim to assess the situation and defining the problems which need to be changed within the education system in Croatia as to educate the future teachers to be competent for the new challenges associated with the school work. 6 questionnaires distributed to the teachers and 2 questionnaires to the students. The sample consisted of 8 elementary schools in Croatia, two out of each region where the population density is highest (middle and northern Croatia). 87 elementary school female teachers and 730 students aged 10 to 11 took part in the research. Statistical analysis results demonstrated that both "burnout at work" and "communication in classroom" are not significantly

correlated. From the results gathered by the authors indicated that teachers are not aware of their lack of communication knowledge and adequate communication skills; teachers do not have sufficient skills to manage conflicts and negotiation; communication in the classroom is interpersonal communication with particular students; teachers do not possess leadership and group communication skills are some problems outlined by the authors. The authors also concluded that communication competencies of teachers are equally necessary for a successful teacher as methodical skills. However, the authors found out that both students and teachers are not aware enough of the importance of quality communication which contributes to the better school climate.

Besides that, Zlatić et al. (2014) consider teachers' communication competence in terms of "interaction involvement"; "social skills"; and "communication conflict management styles" as a necessary competence of teachers. Samples consisted of student prospective teachers, prospective subject teachers, and active teachers in Serbia who participated in communication training from 2006 to 2011. The authors make a comparison of the measured communication competencies between the students-teachers involved in communication training, students-teachers not involved in communication training, active teachers involved in communication training and active teacher not involved in communication training. Findings showed that there are differences in some socio-communication skills between the examined groups and teachers' communication competence is increased after the communication education. Additionally, the authors underlined that it is compulsory to train teachers' communication skills both at the beginning of the training session and consistently in the teaching profession. Thus, in this study, researcher make the assumption that it is critical to investigate the level of teachers' computer-mediated communication competencies in this era of technology advancement where education emphasized more

on blended learning with the increasing proliferation and prioritization of virtual learning environment.

With the advance of emerging ICT and the growing interest in using the Internet for education, a variety of new ICT tools had been introduced and presents teachers with new opportunities for computer-mediated communication (CMC). In Malaysia context, Internet-based virtual learning environment (Frog VLE) was introduced by the Ministry of Education in the year 2012 to permit collaboration and administrative work to be done, as well as teaching and learning to take place through the VLE. Wu et al. (2014) stated that CMC not just facilitates both individual-to-group and individual-to-individual communication through networks but created new opportunities for teachers to interact personally, socially and professionally with other fellow teachers as well. CMC allow teachers to be in steady communication with other educators anytime anywhere without interrupt the classroom activities (Koszalka, 2001). The author added that CMC also permit them to shape new working relationships with teachers from different places in critical thinking and thought sharing. As for students, Walther (1995) found that students who use online meeting places, social networks or any forms of CMC have higher possibility to create personal connections than their face-to-face colleagues.

Additionally, Pynoo et al. (2011) vividly described that in this view of the acceleration pace of technological advancement, teachers need to be constantly adapted to the latest educational technology and be prepared in terms of ICT competencies, skills and knowledge to be able to implement ICT efficiently and effectively into the classroom. We have to accept the fact that the use of CMC in education play a more vital role as compared to the traditional classroom communication where the amount of

face-to-face teacher-student socialization is always limit by time constraints (Mazer, Murphy, & Simonds, 2007). The authors documented that the use of CMC in teaching and learning allows teachers and students to have a good relationship and at the end will bring about student's excellent academic achievement. Furthermore, Kaye (1992) claimed that CMC help to create a new environment of online education and provide unprecedented opportunities for educational interactivity. It can also be used as a powerful tool for group communications among teachers and provide good collaborative virtual learning environments for students.

Indeed, review by Lieberman (1996) indicated that by using CMC, teachers are able to share their stories and got feedback from their peers, thus have better social relationships with their colleagues. CMC lessened the disengagement of teachers by giving them new forms of group interactions besides formal training sessions and new social relationships. On the other hand, Lieberman (1996) noted that network flexibility allows teachers to first organize the activities and after that build up the structures and help the development of relationships within the CMC group which is one of the critical elements in developing teachers' commitment. Hence, above all, in this study, the researcher made the assumption that CMC through Frog VLE plays a crucial role in enabling positive social relationship to build among participants, increases their CMC competence and thus foster positive attitude toward new technologies.

Through literature reviewing, it shows that the definition of computer-mediated communication is not clearly defined and that literature is limited when connecting CMC competence with attitudes. For instances, Kaye (1992) defined computer-mediated communication as the use of computer conferencing systems which can provide shared working and learning spaces; can be used to create both formal and

informal environments and have a number of properties particularly well-adapted for support of collaborative activity. On the other hand, Bubaš (2001) described computer-mediated communication as a process where "exchanges of information in textual, audio, and/or video formats that are transmitted and controlled by the use of computer and telecommunication technology" (p. 25). Thus, it is noticed that what is needed is a clearly defined computer-mediated communication construct that can be behaviourally measured and accessed in human perception.

Most of all, one of the most promising approach is the CMC construct defined by Spitzberg (2006) as, "any human symbolic text-based interaction conducted or facilitated through digitally-based technologies" (p. 630). The relational component model of CMC competence measure by Spitzberg (2006) is generally accepted as a more comprehensive model of CMC competence than those models that include only the cognitive and behavioural components (Jablin & Putnam, 2001). The three personal components, namely, motivation, knowledge and skills have been studied empirically and discussed theoretically (Jablin & Putnam, 2001; Spitzberg & Cupach, 1984; Spitzberg, 2000, 2006, 2011).

Spitzberg (2006) noticed that the three personal components, motivation, knowledge and skill have brought some unity to otherwise diverse conceptualizations and applications of CMC competence. Generally, a major benefit of component models is that it allows individual components to be separated from one another (Spitzberg, 2007). For instances, a person may possess competent knowledge and motivation, but the lack of skills to competently communicate in a context or a person may lack motivation and thereby choose not to be a competent communicator. This separation of components allows the role of each component to be evaluated in relation to overall competence and

such isolation permitted greater precision in construct validation arguments (Spitzberg, 2007). Besides, the isolation of components allows for flexibility to choose what individual components of communication competence to study. Hence, in this study, researcher adapted CMC Competence measure (version 5) from Spitzberg (2006) that looked at three different components of CMC competence measure such as (i) motivation; (ii) knowledge; and (iii) skills.

According to Spitzberg (2006), CMC competence has a significant relationship with end user's experience and use and researcher argued that it might be in reality correlated with teachers' attitude toward using the Frog VLE in this study. Researcher argued that it appears to be sensible to predict that more competent CMC users probably will have more positive attitudes toward using the Frog VLE than less competent users. In addition, Spitzberg (2006) documented that the measure of CMC competence might be useful in helping schools to diagnose their needs at the early stage of ICT implementation and it turns out to be significantly vital to understand the factors that improve user's abilities to use the technology as the technology expand. Thus, it is relatively important to examine the level of teachers' CMC competence and the mediating role of teachers' CMC competence with the relationship between principals' e-leadership practices and teachers' attitude toward using the Frog VLE as the implementation of Frog VLE is still at the early stage.

In the year 1997, Warschauer wrote a paper entitled "Computer-Mediated Collaborative Learning: Theory and Practice" to investigate the nature of computer-mediated communication (CMC) and its potential in supporting collaborative language learning. The authors analyzed five particular features which taken in sums differentiate CMC from other communication media, namely: "text-based and computer-mediated",

"many-to-many", "time- and place-independent", "long distance", and "distributed via hypermedia links". All the five features mentioned above are expected to make online learning a potentially great tool for collaborative language learning. Besides, the results gave an insight on a general theoretical understanding of collaboration and social interactions for language learning and help teachers improve classroom practices.

In addition, Warschauer (1997) reported that there are limited empirical studies on CMC in the language of classroom and schools. Hence, the author asks for more research to be done in order to gain a better understanding of the social, affective and cognitive processes involved in the computer-mediated learning environment (Warschauer, 1997). For a better understanding of social, affective, and cognitive processes involved in the computer-mediated environment, in this study, the researcher aims to investigate teachers' perception of the influence of principals' e-leadership practices on teachers' attitude toward using the Frog VLE and the mediating effect of school virtual learning culture and CMC competencies. Specifically, the researcher examined teachers' attitudes toward using Frog VLE from the three component model of attitudes, namely: affective, cognitive and behavioural and researcher also looks at affective and cognitive processes involved in the computer-mediated environment. Besides, researcher urged to find out is there any mediating effect of school virtual learning culture and CMC competence of teachers on teachers' attitudes toward using the Frog VLE.

More recent, Sherblom, Withers, & Leonard (2013) investigate the factors such as "student knowledge", "motivation", "skill", "apprehension" and the "communication medium" on the level of students participation in online classroom discussions by using survey method. Survey questions were adapted from Spitzberg's (2006) computer-

mediated communication competence questionnaire and computer apprehension measure. 91 students age ranged from 18 to 25 years old from two mid-western universities participated in the study. Regression analysis shows that "student's knowledge", "skill", "apprehension", and "motivation" are the most influential factors on student participation and attitude in online classroom discussion whereas CMC medium itself has little effect. The authors analyzed the influences and conclude the paper with suggestions to help teachers to enhance their student's participation in online discussion. Results suggest that teachers should teach their students the strategies of communicating in a CMC medium such as to cope with the reduced nonverbal cues, to engage with certain conversational tactics, and to use instructor techniques to reduce CMC apprehension. Subsequently, students are more likely to participate in online discussion when they are motivated.

Even though interpersonal impressions were formed more slowly with CMC but many studies suggest that relationships in CMC context developed in the same way as face-to-face situations did (Wu et al., 2014). Further supported by Morreale, Spitzberg, & Barge, (2001 as cited in Spitzberg, 2006) states "basic interpersonal skills are either directly translatable or have close analogs in the CMC context" (p. 642). Spitzberg, (2006) added that assumption of the CMC model is that face-to-face and CMC interactions are very much the same than they are different. Therefore, teachers should work together and cooperate with their students toward the goals which they have set together and at the same times reach to the hearts of his students by computer-mediated communication for work to be done effectively (Bakic-Tomic et al., 2015)

For instance, Kroonenberg (1994) indicated that teachers make a significant influence on students' academic or students' thinking skills or creative skills through

technology tools by stating : “Even the technologically phobic language teacher can become adept at engaging students to use e-mail in skill development, and the timidest language students can come alive while creating meaningful communication via the keyboard and screen” (Kroonenberg, 1994, p. 24). Kroonenberg (1994) found that synchronous communication through online chats allows students in her schools to get practice at fast interaction. This is because they are able to pay more attention when they can pause in the text-based mode that allows them to have reflection during the interaction. The author also finds that when students are writing their composition or in oral conversation, they are less expressive as compared to when they are in online chats. The authors added that when students become familiar with the system, they write more quickly and fluently.

Much of the time, educational systems confront barriers that restrict the successful implementation of ICT. Hew & Brush's (2007) analysis of a large number of studies into the implementation of ICT in K–12 learning environments in the USA and elsewhere reported that there were 123 barriers which affected on ICT implementation. They identified five clusters of explanatory factors for teachers’ differential uptake of ICT which are “technology resources”, “teacher knowledge”, “institutional factors”, “teacher attitudes” and “mandated assessments”. Besides focusing on teachers’ attitude toward using Frog VLE in this study, researcher assumed that teachers’ CMC competence including teachers’ knowledge could act as a mediator to the relationship between principals’ e-leadership and teachers’ attitude toward using Frog VLE. Besides, through extensive literature reviewing, quite a number of studies were found to focus on student’s CMC competencies than to focus on teachers CMC competencies. Studies showed that teachers’ CMC competencies play a critical part in ensuring teachers to viable integrate technology into their lessons and to increase the usage of the

educational technology innovations (Kaye, 1992; Koszalka, 2001; Lieberman, 1996; Pynoo et al., 2011; Warschauer, 1997). Thus, the researcher aims to study explicitly teachers' CMC competence as a mediator and the direct or indirect effect of CMC competence on teachers' attitude toward using Frog VLE in this study.

2.3.4 School Virtual Learning Culture (Mediating variable)

"Culture refers to shared norms about expected behaviour" (Cascio & Shurygailo, 2003, p.374). Cultural characteristics of a school are about how people perceive, think and feel about things at the school (Tondeur, Devos, Houtte, Braak, & Valcke, 2009). On the other hand, Maslowski (2001) defined school culture as "the basic assumptions, norms and values, and cultural artifacts that are shared by school members, which influence their functioning at school" (p.8-9). Additionally, Albirini's (2006, p.377) operationally defined ''Cultural Perceptions'' as "Syrian EFL teachers' perceptions of the value, relevance, and impact of ICT as it relates to the cultural norms in Syrian society and schools" in her study. According to Tan (2010), it is difficult to operationalize the construct to measure school culture. However, school cultural change plays a significantly prominent role in ensuring effective implementation of technology and its sustainability into classroom instructions. In this study, researcher operationally defined ''school virtual learning culture'' as "teachers' perceptions of the cultural values and its cultural beliefs on the impact of Frog VLE as it relates to the cultural norms in Klang district secondary schools that are shared by the school members".

Yuen, Law, & Wong (2003) identified three clusters of characteristics related to the integration of technology based on three different models of change management from 18 most experience schools in using technology in classroom instructions in Hong Kong. Authors found that "the established vision and values of the school", "the perceived role

and impact of ICT in education" and "the established culture and reform history of the school" are the three main key distinctions between the models. In other words, both school principals and teachers play an important role in ensuring high quality and sustainable technology integration into classroom and school. Based on Yuen's et al. (2003) findings, principals are believed to bear the responsibility to establish the vision and values of the school, to know the importance of teachers' perceptions on the role and impact of ICT in education, and lastly both principals and teachers need to understand the established culture and reform history of the school. Hence, in this study, the researcher aims to study the principals' e-leadership practices and the mediating effect of school virtual learning culture on the relationship between principals' e-leadership practices and teachers' attitudes toward using the Frog VLE.

"Different cultures use and perceive technology different ways" (Sujo-Montes & Gallagher, 2011, p.184). In the year 1995, Rogers underlined the significance of the cultural perceptions of teachers to the acceptance of ICT in the school of a given country. Additionally, Lim et al. (2013) stated that adoption of ICT in the school system is influenced and constrained by many conditions such as school technology resources, school culture, readiness and experiences of teachers and students regarding using technology. The operative knowledge, skills, and attitudes constitute the core of teachers' competencies, however, the cultural heritage of teachers should also be taken into account within a certain social environment (Domazet, 2011, as cited in Bakic-Tomic et al., 2015).

Furthermore, Nabeel, Shahrir, & Chin (2013) mentioned that the reason why cultural differences in beliefs should be considered when learning about ICT integration in the education context. It is because individuals from distinct culture and races will have

different educational philosophies and beliefs. Besides that, Chai, Hong, & Teo (2009) documented that culture and context are the barriers to the integration of technology in education. Noted the importance of cultural perceptions to be taken into consideration while study teachers ICT acceptance and use, both Albirini (2006) and Arokiasamy et al. (2015) study the cultural perception of Syrian teachers and Malaysian school principals toward ICT respectively. Albirini (2006) findings show that Syrian teachers saw ICT as culturally appropriate for Syrian schools and society and they did not reject the implementation of ICT. On the other hand, Arokiasamy et al. (2015) findings indicated that Malaysian school principals do not see the computer as a threat for Malaysia culture and the value, relevance, and impact of ICT is related to the cultural norms in Malaysia schools.

According to Tondeur's et al. (2009), teachers' willingness and attitudes are important elements to look at during implementation of ICT but generally, school structural and cultural characteristics likewise are significantly important to support educational change and particularly in the implementation of ICT. Tondeur's et al. (2009) findings indicated that technology integration is correlated to a school profile that reflects higher levels of both structural and cultural school characteristics. Besides, results also re-emphasised how imperative and powerful school-related characteristics are to initiate educational change. Hence, it is clear that both teachers' attitude and cultural school characteristics have its influences on ICT implementation in school.

In addition, Koszalka (2001) noted that discouraging school culture such as isolation of teachers from their peers always lead to a lack of communication among teachers which in turn impact the implementation of ICT in school. For instances, teachers in school only talk to their colleagues about the strategies on utilizing new technology

tools once in a while after they had completed the training even they were interested in utilizing ICT then it will lead to teachers lacking support from their colleagues to use ICT effectively in their teaching and learning process. The author added that the mechanism for the continuation support from colleagues is not sufficient to encourage teachers to keep up with the collaboration among them in implementing ICT in school. Hence, discouraging school culture may also influence the integration of technology and ICT tools in school.

Among the very few studies focuses on cultural norms, Li & Kirkup (2007) examined the distinction in terms of gender, attitudes toward the Internet and computers and its usage between Chinese and British students. Samples consisted of 220 Chinese and 245 British students who answered the survey questionnaire. Statistical analysis showed that both Chinese and British students are distinct in terms of "Internet experience", "attitudes", "usage", and "self-confidence".

Similarly, Jackson et al. (2008) research addressed differences between culture, gender and ICT use. The samples consisted of 600 Chinese and 600 US children with an average age of 12 years old. Results showed that there are cultural and gender differences in ICT use between Chinese and US children. Chinese children used computers and the Internet less and their female students are less intense. Males played videogames more as compared to females, with US males playing more than did Chinese males. US females lead all other groups in cell phone use, whereas Chinese females were least likely to use them. Authors concluded with the discussion on the implications of cultural, gender and sub-cultural group differences in technology use for equity in access to technology and educational interventions for children in the use of technology.

In the cross-cultural context of both Chinese and British students, Li (2002) examined the impacts of national culture on students utilization of the Internet. Due to the different of national culture among Chinese and British students, results indicated that they are different on Internet "experience", "attitudes", "usage", and "competence. Additionally, Jackson et al. (2008) stated that diversity within cultural groups among subcultures due to differences racial and ethnic group must be considered in understanding ICT usage in school.

Furthermore, according to Wang (2003), a useful diagnostic instrument to measure VLE must consider every aspect of user perceptions. Thus, by considering school virtual learning culture as a mediator of the study able to provide a thorough understanding on how teachers perceived their attitudes toward using the Frog VLE. This assumption made is further supported by Chai et al. (2009), the authors argue that culture plays as a mediating variable in the relationship between teachers cultural beliefs and technology usage. Authors mentioned that there is a need to further investigate the relationships between practicing teachers' cultural perceptions and the usage of ICT in schools for teachers' better understand the dynamics at play. Hence, this study was carried out to investigate school virtual learning culture in Klang district daily public secondary schools and its mediating role, the direct or indirect effect of school virtual learning culture on teachers' attitude toward using Frog VLE.

2.3.5 Teachers' demographic characteristics (Moderating variable)

Lennon, Rentfro, & Curran (2012) noted that there is limited number of studies conducted on the profiles of social networking users. Based on the findings of the study, the authors indicated that demographic variables are closely related to end users attitude, beliefs, and the reason why they chose to use the social networks. The authors

concluded that end-user demographics are important factors to be taken into consideration for future research on social networking. For instance, in this study, the researcher aim was to investigate teachers' attitude toward using the Frog VLE (virtual learning environment an e-learning platform), it is thus important to examine the demographic variables which are associated with differences teachers' attitudes toward using the Frog VLE.

Many studies have considered relationships between teachers' attitude toward using ICT and demographic variables, namely, age, gender, computer experience, and teaching experiences. One study found an increase in age to have a slightly negative correlation to teachers' attitude toward using computer (Becker, 1999), another found positive correlation as more senior teachers held more positive attitude (Hung & Hsu, 2007), and a third found no correlation (Kusano et al., 2013).

On the other hand, research on the relationship of gender to teachers' attitude toward using ICT has typically indicated no relationship (Albirini, 2006; Cavas et al., 2009; Kay, 2006; Nabeel et al., 2013; Teo, 2008; Williams, 2015; Wong & Atan, 2007). In which studies have found a relationship, they generally reveal male to be more likely to have a positive attitude or showed higher interest in using the ICT (Hung & Hsu, 2007; Kusano et al., 2013; Li & Kirkup, 2007; van Braak et al., 2004). However, Cakir (2014) in his study showed that female possessed positive attitude toward computer use and female's interest for computer use is higher than male. In addition, Cavas et al. (2009) documented that experience with computer and are one of the most commonly cited variables associated with positive attitudes and consistently associated with positive effects for preparing teaching and learning materials.

There are different reasons and different demographic variables that might explain the inconsistency of findings concerning teachers' attitude toward using ICT. Thus, in this study, researcher considered four demographic characteristics of teachers which are age, gender, computer experience, and teaching experiences as moderators to examine the relationships between principals' e-leadership practices and teachers' attitude toward using Frog VLE. Some relevant studies on the relationships between teachers' attitude toward using ICT or computer with age, gender, computer experience, and teaching experience are discussed as below.

A study by Cakir (2014) is conducted with Computer Attitude Scale to determine preschool teachers' and principals' attitude toward computer using. The survey is conducted on the volunteer 460 teachers and 308 school principals who have nursery classes in their schools in Sakarya. Arithmetic means, t-test and one-way analysis of variance were performed in addition to descriptive statistics, Pearson correlation coefficients were calculated and multiple linear regression analysis was used in the study. Generally, results showed that there are significant differences between the attitudes toward using computer and gender, marital status, age and educational status variables.

In the year 2007, Hung & Hsu conducted a survey in Taiwan to examine teachers' attitude toward the computer and their computer-based technology application in instruction. Based on the data collected from 70 secondary sciences teachers, the researcher found that there was a significant difference between teachers' attitude toward computer with age and seniority. The more senior teachers held more positive attitude. With regard to gender, the researcher found out that male teachers used more computer-based technology in their instructional practices compare to female teachers.

However, contrarily from others finding, researcher indicated that middle-aged and more experienced teachers tend to integrate more computer-based technology into their teaching as compare to younger and novice teachers.

The main objective of van Braak, Tondeur, & Valcke (2004) study was to examine the effect of demographics variables such as age and gender, computer experience, and attitude toward using a computer on supportive computer use and class computer use. The subjects were 468 teachers working in primary education in East-Flanders, Belgium. Results indicated that positive attitudes toward computers have a direct significant effect on computer use in the classroom. On the other hand, computer experiences including frequent users of computer and those who have high computer experience training are significantly correlated with computer use. In addition, gender is also strongly related to different computer experience variables. However, age is not significantly correlated with supportive computer use based on the analysis. Researchers added that there are limitations of explaining complex forms of professional computer use based on individual determinants and quantitative models of the study. Thus, researchers concluded the article with some implications for practice and recommendations for further research.

Studies of Li & Kirkup (2007) illustrates the significance of gender in both Chinese and British student's attitudes toward, and use of computers, within different cultural contexts. Results indicated that men in both countries are more likely to use ICT than women. Men are more self-confident about their computer skills and they are more likely to speak out their view that using computers was a male activity than a woman in both countries. Results also indicated that British group shows higher gender differences as compare to the Chinese group.

Ocak & Akdemir (2008) intend to find out the level and frequency of science teachers' use of computer applications to teach in the classroom in Turkey. Additionally, authors examined science teachers' perceptions about the implementation of computer applications and the factors that might affect their computer literacy. The survey was administered to 63 primary school science teachers from the Northwestern part of Turkey. Based upon data analysis**,** it shows that high computer literacy among teachers is able to increase their computer use and finally increase their integration of computer applications to teach in the classrooms. The most frequent use computer applications by the teachers are the Internet, email, and educational software CDs. Besides, it shows that there is gender differences exist between teachers.

In a study to examine the effects of teachers' demographic characteristics on their attitude toward technology integration in Japan and U.S. primary school, Kusano et al. (2013) conducted a cross-cultural comparative study. From the results of the multiple regression analysis showed that gender is a significant predictor for Japanese teachers' attitude toward technology integration. Male Japanese teachers have a more positive attitude than the female Japanese teachers. However, both age and teaching experiences were not predictors of the Japanese teachers' attitude toward technology integration. As for U.S., gender, age and teaching experiences, all are not a significant predictor of their teachers' attitude toward technology integration.

In 2007, Wong & Atan carried out a quantitative study on gender difference in attitude toward the ICT tools usage and applications. Data were collected from 102 pre-service teachers in the Faculty of Educational Studies, Universiti Putra Malaysia who were registered for a compulsory discrete IT course. Two sets of questionnaires were administered to the students on the first day and on the last day of the course. The

researcher found out that mean score of female and male in respect of their prior computer experiences did not yield any significant difference. Thus, can be concluded from the findings obtained, both genders has the same levels of attitudes before and after undergoing the mentioned course. Furthermore, the researcher stated that both male and female pre-service teachers show positive attitudes toward information technology usage and the experience gained from the course improved the attitude toward information technology usage.

The purpose of the study of Cavas, Cavas, Karaoglan, & Kisla (2009) is to examine Turkish primary science teachers' attitudes toward ICT and the relationship between teachers' attitudes with gender, age, at home and computer experience. A survey instrument was developed by researchers to obtain data from 1071 science teachers of primary schools during the school year 2004-2005 through stratified sampling procedures. Descriptive analysis indicated that Turkish science teachers have positive attitudes toward ICT but there is no significant difference between ICT attitudes of Turkish science teachers in terms of gender. However, the findings of the study revealed that there is statistically significant difference between teachers' attitudes regarding age at home and computer experience.

Another study carried out by Kay in 2006 to explore the effect of accessibility to the computer on gender differences in pre-service teachers with respect to computer attitudes, ability, and use. Results showed no significant differences between male and females regarding computer attitude and ability after the implementation of laptop programs even though it shows that male teachers possessed higher levels of computer attitude and ability before the implementation of the laptop program. The researcher said that gender equalization effect observed in the study could have a significant

impact on the extent to which technology is used by future teachers training and students in promoting the use of technology in the classroom. Besides, the researcher claimed that the integrated approaches to using technology in pre-service education had a noteworthy and positive effect on both male and female computer ability and attitudes.

On the one hand, Nabeel et al. (2013) investigate and measure 289 postgraduate students' attitudes toward the computer and Internet use using quantitative study with the multivariate design. Attitudes scales are adopted to assess postgraduate student's attitudes toward computer and Internet use. Generally, the study aims to examine the relationship between postgraduate students' attitudes toward computer and Internet use with gender, the field of study, ethnicity, and age. Results reveal that age is significantly correlated with students' attitude toward computer and Internet use, however, it shows that students' attitude toward computer and Internet use is not significantly correlated with gender, the field of study, and ethnicity.

On the other hand, in the year 2015, Williams carry out a study to look at the factors that might influence the integration of computer use in the classroom and to examine K-12 teachers' attitudes toward ICT usage in schools among 179 teachers in a Northeast Mississippi school district. Teachers' demographic characteristics such as computer experience, access to a computer at home, age, gender, teaching level, teaching field, ethnicity, and education level were asked in the survey. The descriptive statistic, t-test, and an Analysis of Variance (ANOVA) were used to analyze the data. Having investigated, it appeared that teachers had positive attitudes toward computers. Nevertheless, results stated that 93.3 % (167) of the respondents had access to computers at home and 88.3% (158) of the teachers had one year or more experience with computers. The result analyzed from ANOVA revealed that age does not predict

teachers' attitudes toward computers. Similarly, results showed that computer anxiety, computer confidence, computer liking, and computer usefulness are not significantly correlated with gender. This meant that gender does not predict teachers' attitudes toward computers.

Besides, Teo (2008) in his study to examine the attitudes toward computers use among pre-service teachers in Singapore showed no gender or age differences among pre-service teachers on computer attitudes. Similarly, multiple regression analysis indicated a negative predictive value with age in his study. In addition, Albirini (2006) in his case study to find out the attitudes of Syrian EFL teachers toward ICT found out that teachers' attitude is not significantly related to any of the teachers' personal characteristics such as gender, ages, teaching experiences and education level. Only teachers' training background on the computer is significantly correlated with teachers' attitude toward ICT.

Becker (1999) surveyed on teachers' backgrounds such as years of teaching experience, age, technology experience, duration of computer use with students, and education background to examine the correlation between perceived value and Internet use. Generally, results suggested that a teacher with less teaching experience is unsure of the need to use the Internet or virtual learning environment in the classroom. Moreover, results indicated that teachers' perceptions about the value of Internet use were correlated with their education background. Hence, teachers with higher education background seem to take up leadership positions in the school and they seem to have better skills in computer. Becker (1999) shows that young teachers possessed more positive attitudes toward the use of the Internet in their classroom because younger teachers have grown up with computers and they feel comfortable with technology.

Hence, they are very comfortable in using the Internet. However, data showed that duration of a teachers' use of computers with students or technology experiences is not significantly correlated with teacher use of the Internet.

Studies on technology adoption have shown that computer experience and attitudes toward using technology are significantly correlated (Ropp, 1999; Woodrow, 1992; Yildirim, 2000). Based upon cross-sectional data analyses, Potosky & Bobko (2001) examined the relationship between locus of control, two sets of beliefs about computers as electronic performance monitors, general computer attitude, and computer experience. Results indicated that computer experience and computer attitude is positively correlated with one another. It shows that computer attitude is associated with computer experience. In addition, results showed that computer attitude is a significant predictor for computer experience and authors suggests that a reciprocal relationship between computer attitude and experience may be possible. Thus, can be assumed that positive attitude toward computers is positively correlated with greater computer experience. Besides, many studies also reported that teachers' experience in using computer relates positively to attitudes toward using computer and ICT (Buabeng-Andoh, 2012; Cavas et al., 2009; van Braak, 2001; van Braak et al., 2004; Williams, 2015; Wong & Atan, 2007; Yildirim, 2000). Thus, in this study, researcher considered teachers' experience with the computer as another variable to be further examined as well.

Sadik (2006) intend to examine the relationship between gender, years of teaching experience, computer use, computer experience, and computer attitudes of Egyptian teachers. The report indicated that there are gender differences in teachers' computer attitudes and computer use. Besides, computer experience was found to affect teachers' computer attitudes. In other words, teachers who have high experience have lower

anxiety, higher confidence, positive feelings, and high perceptions of usefulness. However, finding indicated that of a teacher was not significantly associated with their attitudes toward computers.

Roussos (2007) explored the relationship between gender, age, computer experience, and confidence with computers on the participant's responses on the Greek Computer Attitudes Scale. Data was collected from four different samples (Samples1, 2, 3 and 4) from the general Greek population. Sample 1 and 2 consisted of 185 and 354 individuals respectively. Sample 3 consisted of 222 teachers and sample 4 made up of 99 undergraduate students. Samples 2, 3 and 4 were administered the Greek Computer Attitudes Scale and the collected data were analyzed. Results indicated that gender did not have a significant effect on Greek Computer Attitudes Scale scores. Generally, the relationship between age and Greek Computer Attitudes Scale was not significant, however, perceived computer experience was strongly related to positive attitudes toward computers.

In the year 1997, Christensen collected background information from research samples regarding a number of years of experience teaching, the rate of experience with computers, whether they have a computer at home, gender, and age. According to Christensen (1997), experience with a computer have a positive effect on teachers' attitudes and the increased of computer experience reduces teachers' computer anxiety. The author added that teachers' attitudes toward computers might impact their students' experiences besides their own computer experiences. Additionally, Gilakjani & Leong (2012) indicated that teacher is a key to successful integration of any educational technology innovation and given that teachers have tremendous potential to transmit beliefs and values to students. Thus, it is imperative to consider teachers' perceptions of

the new ICT tools and the factors that might contribute to teachers' positive attitudes. Besides, experience with computer often fosters positive attitudes toward using computers (Gilakjani & Leong, 2012).

As discussed in the above section, the relationship and impact of gender, age, computer experience, and teaching experiences on end user's attitude toward information technology has been actively documented. Nevertheless, all the above mention studies, which carried out among teachers from a different level of education institution indicated that gender, age, computer experience, and teaching experiences impact end user's attitude toward information technology to a certain extent. These are definitely factors of concern as Frog VLE is considered a crucial and effective tool to strengthen teaching and learning process and in managing the school.

Further supported by some of the recent international literature that concludes gender, computer experiences, teaching experiences, and age variables as important predictors of end user's attitudes toward using educational technology innovations (Kusano et al., 2013; Williams, 2015). It has been difficult to demonstrate consistent results with regard to the demographic variables (gender, age, teaching experiences, and computer experiences) as antecedents to teachers' attitude toward using ICT in school. Hence, the researcher decided to study the effect of teachers' demographic characteristics such as gender, age, computer experience, and teaching experiences as moderator to the relationship of principals' e-leadership and teachers' attitudes toward using Frog VLE in this study. Table 2.2 summarized selected antecedents (demographic characteristics) of teachers' attitude toward using the ICT in the previous studies discussed above.

Table 2.2: Summary of Selected Antecedents (demographic characteristics) of Teachers' Attitudes toward Using ICT

	Gender	Age group	Computer experience	Teaching experiences
Christensen (1997)	X	X	X	X
Becker (1999)		X	X	X
Yildirim (2000)			X	
van Braak (2001)	X	X	X	
Potosky & Bobko (2001)			X	
van Braak, Tondeur, & Valcke (2004)	X	X	X	
Sadik (2006)	X		X	X
Kay (2006)	X			
Albirini (2006)	X	X		X
Hung & Hsu (2007)	X	X		
Wong & Atan (2007)	X			
Roussos (2007)	X	X	X	
Teo (2008)	X	X		
Cavas, Cavas, Karaoglan, & Kisla (2009)	X	X	X	
Gilakjani & Leong (2012)			X	
Kusano et al. (2013)	X	X		X
Cakir (2014)	X	X		
Williams (2015)	X	X	X	

2.4 Literature on Relationship between Variables

In the following section, the researcher will focus on the related literature review and empirical studies pertaining to understand the relationship exist between each of the latent variables in the study. This study investigates teachers' attitudes toward using the Frog VLE as the dependent variable in relation to principals' e-leadership practices as the independent variables, teachers' computer-mediated communication competence and school virtual learning culture as the mediating variable and teachers' demographic characteristics as moderating variable. At the end of chapter two, the researcher will present the proposed conceptual framework for this study based on the relationships exists between each of these variables.

2.4.1 Relationship between Principals' E-Leadership Practices with Teachers' Attitude

"We are not living a time of change, but a change of times. The concepts of leadership, talent, skill and attitude coined in the 20th century need be revised to match the pace of this new digital era" (Pinedo as cited in Korte & Husing, 2015, p.24). From the above statement, both variables such as leadership and attitude in this study seem to highlight by the author and stated that there is a need for these two variables to be revised to match the pace of this new millennium. According to Mishra et al. (2016), school leaders plays a significantly important role in guiding the internal systems of a school, it is particularly relevant to the emergent interplay between organizational structures and the technology integrated within them. This is because leadership can impact the social structures of an organization that might foster or hinder the integration of ICT.

Further supported by Gurr (2004), stated that "there is a symbiotic relationship between leadership and ICT use in which developments in ICT lead to changes in leadership behaviour, and as leadership behaviour is altered, new uses for ICT occur" (p.122). As we can see from the above statement that if principals as a leader change their behaviour, it is assumed that new uses of ICT will occur. As we know, leader's can influence follower's belief and attitude. Leaders is a crucial starting point to change the context where there is a chance that they can change a person's belief and behaviour (Fullan, 2003). According to Liaw et al. (2007), principals' leadership is a critical factor to influence teachers' attitudes from the social perspectives. In simple words, the interaction between principals and teachers is a success factor to increase the usage of Frog VLE as a tool to help teachers to carry out their daily practices. If a leader changes their attitude and uses ICT in school then it will indirectly influence follower's attitude

toward using the technology tools as well. Hence, the researcher makes the assumption that principals' e-leadership practices will influence teachers' attitude toward using the Frog VLE in this study.

Ottestad (2013) carried out an online survey in 2009 on 247 school leaders and 386 teachers from Norwegian primary and lower secondary schools. The aim of the study is to examine if the attitudes and behaviours of school leaders with regard to ICT in their schools correlate with the attitudes and behaviours of teachers. Four construct variables, namely: digital practice, ICT maturity, assessment and roles using ICT and leadership for collaboration are utilized as indicators of important dimensions for school leadership that promotes the use of ICT. These indicators are informative on school leaders' decisions and beliefs regarding their schools as ICT-using organizations. Besides, the indicators of school leadership for ICT carry traits of perspectives from distributed, transformational and pedagogical leadership. Findings indicated that the indicators were correlated with the time teachers spend on ICT in the classrooms and for administrative use, and their use of common digital tools. The indicators of school leadership for ICT were also correlated with a construct measuring the teachers' attitudes toward innovative and student-centred pedagogy. Ottestad (2013) stated that school leadership is strongly associated with the teachers' use of digital tools in schools and end the paper by calling for more research in order to align the practice-based indicators with more overarching theoretical concepts. In response to calls for more research in this area of studies and based upon Ottestad's (2013) findings, in this study, the researcher makes the assumption that there will be a correlated relationship between principals' e-leadership practices with teachers' attitude. Specifically, the aim of this study is to investigate the relationship between principals' e-leadership practices with

teachers' attitudes toward using Frog VLE in daily public secondary school in Klang district.

According to Lim et al. (2013), schools as an organization are like any ecosystem that has the tendency or ability to maintain internal equilibrium. ICT introduced into schools is not independent or isolated but it is situated in the ecological system of the school and connected to its broader systems. By using the metaphor of schools as ecological systems, the authors examines why schools have not fully taken up the opportunities of technological innovations for teaching and learning. The authors added that introduction of new ICT affects the equilibrium of the ecosystem at different degrees despite the intention and concluded that whether the opportunities of successful uptake of technology in schools are determined by the dynamic co-adaptation and co-evolution of students, teachers and school leaders with technology. Thus, whether the technology can be fully utilized by the schools are depends solely on the users itself and there is a need to find out users attitudes toward using the technology so that there are opportunities for the virtual learning environment to be realized in schools.

From the non-educational perspective, Aarons (2006) noted that leadership in organizations play a significant role in molding workers' perceptions, their responses to change, and their acceptance toward technology including evidence-based practices. The author aims to study the correlation between transformational and transactional leadership with mental health providers' attitudes toward adopting the evidence-based practice. Data collected from 303 public-sector mental health service clinicians and case managers from 49 programs who were providing mental health services to children, adolescents, and their families. Zero-order correlations and multilevel regression analyses were conducted. Results indicated that both transformational and transactional

leadership were positively associated with providers' having more positive attitudes toward adoption of evidence-based practice.

As we know, integration of ICT into education has become essential in this era of digital. Research proved that principals' leadership could be associated with teachers use of ICT in schools (Celep & Tülübaş, 2014; Ottestad, 2013; Waxman et al., 2013). Celep & Tülübaş (2014) indicated that it does not seem possible to effectively integrate technology in school without teachers' genuine efforts. Thus, it is important to examine the relationship between school leader technology leadership and teachers' attitude toward ICT. Authors adapted both "Technology Leadership Scale" and "Attitude toward Educational Technology Scale" for data collection. Results indicated that school principals demonstrated a high level of technological leadership practices and teachers possessed a positive attitude toward educational technologies. However, results indicated that principals' technological leadership had little impact on teachers' positive attitude toward the utilization of ICT and it is not significantly correlated with teachers' negative attitude.

On the one hand, Adegbesan (2013) adopted a descriptive research design to investigate principals' leadership style and the impact of such styles on teachers' working attitude. The objective is to examine the effect of principals' administrative leadership style on teachers' working attitude. Secondary school principals and teachers from Abeokuta south local government area are selected through random sampling method to participate in the study. Structure questionnaire was administered and interview was conducted. Findings from statistical analyses revealed that principals' evaluative habit have an impact on teachers' working attitude in school. In addition,

results showed that principals' leadership styles and behaviours influence teachers' working attitude significantly.

On the other hand, Kelloway, Barling, Kelley, Comtois, & Gatien (2003) carry out two studies of remote transformational leadership. 175 students read either "laissez-faire", "management by exception", "contingent reward", or "transformational leadership style" communicated through e-mail in the first study. Findings indicated that students able to differentiate between different leadership styles, and when transformational style was shown, students shows higher in both interpersonal justice and supervision satisfaction. The authors adapted a 2x2 design where 105 undergraduates were asked to complete individual and group problem-solving tasks after reading an e-mail containing either an intellectually stimulating or charismatic message in the second study. Results showed that participants able to identified the leadership style intended by the e-mail. In addition, under the leadership conditions, motivation, individual performance, and group performance were higher. Generally, findings show that both virtual and face-to-face transformational leadership have similar impact toward students' attitude and performance. Findings also argue that technology could use to convey the similar information as in face-to-face interaction, which questions the argument that leader-follower distance has a negative impact on performance and followers' perceptions of their leader.

In addition, Preston et al. (2014) in their study defined e-leadership as the effective promotion and integration of technological learning and literacy into and within education environments, regardless of any formal leadership position. According to Preston et al. (2014), the nascent concept of e-leadership is a new way of examining effective leadership, where an individual's influence produces a change in attitude,

feeling, thinking, behaviour, performance with individuals, groups, or across organizations. The authors collected qualitative data from eight students who attended a course entitled "communications". Findings indicated that not only did student's attitude toward the assignment change but students gained many benefits associated with the activity. For instance, by communicating through Twitter, students embody e-leadership which generates learning led by the student's skills, personalities, personal knowledge, and interests. Thus, it appeared that there is a correlation between e-leadership practices and individual's attitude toward the subject matter and it seems that there is a correlation between e-leadership practices with skills and knowledge of the end-users as well.

Besides that, not only school principals' role as a technology leader in school is important, teachers, students, and members of the school community need to assume the collaborative and reciprocal role of e-leadership. The power of e-leadership will only akin to sustainable and on-going digital learning in such a manner (Preston et al., 2014). Thus, principals' e-leadership is important but teachers, students, and members of the school community also play an important role in ensuring successful implementation of technology innovations in school as well as sustainability of the usage of technology innovations. Therefore, it is relatively important to find out the level principals' e-leadership practices and teachers' attitudes toward using the Frog VLE and the relationship between these two variables.

2.4.2 Relationship between Principals' E-Leadership Practices with Teachers' Computer-mediated Communication Competences (CMC)

"Information technology and telecommunications are essential tools for business and industry and are now firmly established learning tools in education" (Lackney, 2005, p.522). Chandra & Mills (2015) study investigates how teacher-driven change and innovation that lead to successful implementation of ICT impact the teaching and learning process. Qualitative data collected from 10 experienced teachers in an Australian high school showed that technology has a positive significant effect on the teaching and learning process. Teachers will have different pedagogical approaches and the types of learning activities they planned and carried out change when they use technology and this will motivate and benefit the students. The authors mentioned that through the support from the school leadership team, the built environment enable teachers to use technology. Hence, support from school leaders plays an important role in ensuring teachers use ICT in school.

This is further supported by Jensen (2012), documented that support from principals leadership leads to successful school reform in Asia school system. School principals had the powers to implement strategic changes in the school. In fact, leadership is about seeking for constructive and adaptive change, or basically, leadership is about coping with change (Kotter, 2012). The authors noted that the primary leadership role is to produce development and change. Hence, leaders need to establish direction for future by developing a shared vision, and then the leader must widely communicate the vision to align people and inspire others to overcome obstacles. According to Qteishat (2014), the perception of the quality of communications systems influences the decision of followers to use the system with the application of e-leader model. Based on Qteishat (2014) justification, it shows that e-leaders do have the ability to influence follower's

perception of the quality of communications systems and their decisions to use the systems.

On the other hand, Avolio et al. (2009) indicated that both leaders and followers have to accept the use of computer-mediated communications in a leadership dyad for the communications process to be effective. In addition, if there is resistance to the use of the particular type of technology for communication, it will not lead to effective leadership communications (Qteishat, 2014). Kazi Enamul et al. (2012) also stated that effective school administration is the key factors to large-scale, sustainable education reform. The authors noted that principals and teachers should have an effective communication network with students, parents, and stakeholders. Use of virtual learning environment such as Frog VLE will enhance this trend.

In the year 2004, Gurr noted that it is much more difficult to communicate in virtual settings and to build and maintain a healthy social climate among virtual team members. However, effective communication among team members is the key to the effectiveness of the team author added. On the other hand, Pulley & Sessa (2001) indicated that e-leader's communication skills required to unify and motivate virtual team members toward common goals are as important as ever. Besides, Zaccaro & Bader (2003) stated that effective e-leaders should be able to be a team liaison, team direction setter and team operational coordinator. E-leaders should be able to communicate clearly the team goal; able to communicate the understanding of the team task; able to moderate team conflict and managing team affect by effective communicative skill. The authors further stated that the main challenge of e-team leaders is that under the condition where they need to use constrained means of communication to lead a virtual team.

Further supported by Chang (2012) stated that interpersonal and communication skills are very important and actually override technological skills. Indeed, communication is the first skill that school leaders should have when new ICT infrastructures are introduced in schools. E-leaders must be able to provide support through proper communication (Chang, 2012). Additionally, Mojgan et al. (2009) stated that when teachers decide to adopt new ICT tools in schools they need principals technical support and administrative support. Thus, principal has to provide necessary support in terms of technical and also teachers' development. Principals need to ensure that teachers are competent in using CMC as a leader is crucial to the quality of CMC activity (Kaye,1992). Principals are believed to have influences on teachers' skills, knowledge and motivation toward using CMC (Chua & Chua, 2017b; Kannan, Sharma, & Zuraidah , 2012; Lord & Brown, 2001; Mwawasi, 2014; Van Niekerk, 2009).

Lord & Brown (2001) built a model by looking at two distinct ways that leaders might affect followers' motivations and behaviours or actions. The first way relates to values and the second relates to the followers' self-concept. Firstly, leaders make specific values salient for the follower to motivate them to action and secondly to activate a specific identity to which followers can relate, creating a collective identity that the follower ultimately embraces as his or her own. Values and self-concept are viewed as a mediating factor that linked both leaders' actions and followers' behaviours (Lord & Brown, 2001).

In addition, according to Lord & Brown (2001), prior studies have shown that values are organized in a manner that complements various self-identities so that values and identities are likely to have mutually reinforcing effects on motivation. It is clearly stated that leadership influences follower motivation through follower's values and

identities and mediating between leader's actions and follower's behaviour. Hence, based on this justification, in this study, researcher presumed that principals' e-leadership practices do influences teachers' motivation to certain extend and teachers' motivation mediating the linkage between leader's action and teachers' attitude toward using Frog VLE in terms of affective, cognitive and behavioural. Lord & Brown (2001) also stated that both values and identities can be viewed as relatively enduring criteria used in generating and evaluating behaviour, cognitions, and affect. Since motivation is one of the components of CMC competence, it is thus reasonably acceptable to assume that principals' e-leadership practices do influences teachers' CMC competence and teachers' CMC competence influences teachers' attitudes toward using Frog VLE.

Integrating ICT requires teachers to possess the right skills and right attitude (Kannan et al., 2012). The authors added that teachers are found to be relating their performance to the school principal or in other words, school leader act as role models to the teachers. According to Kannan et al. (2012), when teachers perceive a good leadership from their principals, they seem to be actively involved in the programs that are developed by the school principal to enhance their ICT skills. School leaders can inspire their teachers to enquire for more knowledge and skills and be able to ensure complete and sustained implementation of the vision by realizing their role as technology leaders and show better leadership and vision for the implementation of ICT. Both knowledge and skills are an important component of CMC competence. Based on Kannan et al. (2012) point of view, in this study, researcher make the assumption that principals' e-leadership practices do influences teachers' CMC competence.

Mwawasi's (2014) study aims to investigate how school leaders help to build teachers' capacities in order to integrate technology into their classroom effectively in a

public secondary school in Kenya. Purposive sampling was used to obtain data and participants consisted of the school principal, four middle managers and four teachers from the specific school. Researcher operationally defined capacity as the "skills, knowledge, relationships, values and attitudes among many other attributes such as health and awareness". Findings indicated that school leaders introduced teachers with some basic computer skills and skills on how to use ICT tools seem to affect teachers' appreciation toward educational technology. In addition, the school leaders not only able to influence teachers acceptance and implementation of pedagogical changes but also able to reduce the digital divide within the school context. Subsequently, contributed to the capacity building of the school organization by providing teachers opportunities to learn new computing skills at the school level. Hence, school leaders play an important role in enabling the effective use of ICT and provides an opportunity for teachers to learn knowledge and skills needed to use the educational innovation technology.

According to Van Niekerk (2009), principals play a vital role in leading school reform, implementing innovations and bringing about change. The author indicated that teacher will be able to implement technology effectively in their teaching methods if only they attain the necessary knowledge and skills. Van Niekerk (2009) carry out a study to determine the influence that principals have on teachers' ICT integration through teacher professional development. The purpose of teacher professional development is to assist teachers in attaining the required skills and knowledge to make optimal use of ICT. Findings indicated that principals' positive attitudes, positive comments as well as being knowledgeable lead to motivated and inspired teachers. Besides that, principals who are knowledgeable about ICT and teacher professional development related issues were in a position to create appropriate teacher professional

development to assist teachers in improving their skills and knowledge for effective ICT integration. Thus, it seems that principals will have an influence on teachers' skills and knowledge needed to make optimal use of ICT through teacher professional development and support.

On the other hand, Hambley et al. (2007) stated that not much research focus on how virtual team interaction is affected by e-leadership. In the year 2015, Mohd Yusri conducted a study to investigate the contribution of e-leadership toward intra-team communication and job performance. Mohd Yusri (2015) findings indicated that intra-team communication is the mediator to the relationship between e-leadership and job performance. Besides, findings indicated that the model fits better with intra-team communication as a mediator than without mediator. The author also stated that follower's job performance and the effectiveness of communication among leaders and followers in an organization is still depending on leadership behaviours despite the virtual environment. Further supported by Cascio & Shurygailo (2003) that effective e-leader's are those with good behaviours of virtual collaborative, socialization, and communication skills.

As we can see, numerous researches have identified communication skills among virtual team members and e-leader are one of the core attributes of effective e-team (DasGupta, 2011; Gurr, 2004; He, 2008; Zaccaro & Bader, 2003). In addition, according to Lackney (2005), having access to the technology is only the first step in the effective use of technology in schools. Ideally, expected modes of communication between students, teachers, and administrators should be clarified. Thus, as a school leader, principals should find out what are the expectation from the teachers, students, and administrators. For instances, will teachers be expected to use Frog VLE to send

and receive materials from students? Will parents be encouraged to communicate through Frog VLE with teachers about their child's progress? How does school administration expect to use Frog VLE in communicating with parents and the community?

Recently, Chua & Chua (2017b) study aimed to develop a grounded model of technology leadership in a school e-learning platform known as Frog VLE. Data collected from 20 school leaders, teachers, students, and parents through a semi-structured interview to gather the themes of technology leadership in schools and the model is then validated with a quantitative survey study involving 209 principals. According to Chua & Chua (2017b), great technology leaders are those who able to provide clear vision and mission for networking and able to provide training pertaining teachers' computer-mediated communication competence. This is because teachers' CMC competence could help to build a positive relationship between principal and teachers and subsequently help to increase the usage of e-learning platform (Chua & Chua, 2017b).

In this study, the researcher argued that principals need to ensure that teachers need to have positive attitudes toward using the Frog VLE and at the mean time are competent in using computer-mediated communication in order for effective leadership communications to take place. This shows that both CMC competence and teachers' attitude toward using the Frog VLE play a significant part in ensuring effective leadership communications between teachers and principals. In other words, to inculcate positive attitudes of teachers toward using the Frog VLE, there is an urgent need to enhance teachers' CMC competence for the betterment of the application of educational technology innovations.

Based on the literature reviews on this section, it was found that principals' e-leadership practices do have some impact on teachers' CMC competencies in terms of motivation, knowledge, and skills. However, the researcher found that there is still a lack of empirical studies on the direct relationship between principals' e-leadership practices and teachers' CMC competence. Hence, the researcher would like to investigate the relationship between principals' e-leadership practices and teachers' CMC competence in Klang district secondary schools.

2.4.3 Relationship between Principals' E-Leadership Practices with School Virtual Learning Culture

The 2014 annual learning and development survey found that driving culture change is now the number one focus of leadership development activity for front-line school leaders and administrators (Balogun & Stuart, 2014). According to Anderman, Belzer, & Smith (1991), different principal behaviours foster different cultures or "environments" within the school. Sohawon et al. (2015) address that culture impacts each and every thing that happen in schools. School principals are the key to shaping school culture and to communicate core values in their daily work including their words, nonverbal messages, actions, and accomplishments whereas teachers reinforce those values in their work. In addition, e-work culture in a school organization must first be established from a bottom-up approach and same must be felt by teachers before they will show the interest and the need to use ICT tools in classroom situations (Sohawon et al., 2015). Thus, it is important to look at school virtual learning culture from the perspective of teachers and how the roles of principals' e-leadership practices influence teachers' perception of school virtual learning culture.

"E-leadership through the school system changes the entire school culture" (Blau & Presser, 2013, p.1). The authors conducted semi-structured interviews with eight secondary school principals in order to investigate their e-leadership experiences through the Mashov school data management system which consequently increased school effectiveness. The e-leadership of principals requires that they make data-based decisions, monitor curriculum implementation and learning performance, interact with teachers, students, and parents, improve the school climate, and raise the level of student and parental involvement. Blau & Presser (2013) indicated that school principals shall lead the integration of ICT in school and play a vital role in initiating significant changes in the entire school culture.

Anderman et al. (1991) authored the report for the annual meeting of the American Educational Research Association by presenting the results of three analyses which examining the relationships between teachers' perceptions of school leadership, school culture, and teacher satisfaction and commitment. Quantitative survey findings collected from 101 teachers from Illinois, 241 teachers from Arizona, and 416 teachers from Florida support the theoretical notion that principals' behaviours foster different working environments within the school, and these different types of environments are highly predictive of teacher satisfaction and commitment. Statistical analysis of multiple regressions showed that school culture that stresses accomplishment, recognition, and affiliation is positively correlated with satisfaction and commitment and that different principal action creates different cultures within the school. The authors described that when the school fosters teacher involvement in school decisions, respect, encouragement, and the feelings of working together and sharing of information, the teachers are more satisfied. Besides, results also indicated that teachers who perceive their principals as strong leaders will have positive perceptions of school culture

whereas teachers who perceive the school culture as being strongly power-oriented are more likely to have negative perceptions of school leadership.

On the other hand, path analysis focusing on the mediating role of teacher perceptions of school culture and the relative impact of different leadership behaviours on teacher satisfaction and commitment supported research hypothesis where teachers' perceptions of their principals have a direct impact on their perceptions of school culture, and that school culture is associated with teachers' level of satisfaction and commitment (Anderman et al., 1991). Besides, results also showed that different types of perceived-leadership behaviours may foster different aspects of school culture and five leadership variables namely, promoting instructional climate, defining the mission, monitoring student progress, supervising teaching, and managing curriculum were significantly related to at least one of the school culture variables. The authors end the report by calling for more research to examine specific ways to develop school cultures that foster a sense of affiliation, recognition, and accomplishment among teachers.

Few studies focused on creating a broader understanding of issues related to cultural differences in different context and the implications of this to the e-leaders. Jameson (2013) highlights the importance of intercultural skills of e-leaders to build high trust among team members in the ICT mediated environment. Fan (2013) noted that the characteristics of e-leadership may vary across a variety of cultures. Likewise, He (2008) researched on various factors including culture differences that contribute to team conflict and performance. The author stated that e-leaders can benefit from a better understanding of factors that trigger conflicts among team members which in turn might affect the team performance. Indeed, according to Pulley & Sessa (2001), the greatest e-leadership challenge among all is how to create a culture that allows all the voices of

leadership to be heard and to make individuals commit collectively. Additionally, Park & Popescu (2014) empirical findings stated that cultural differences among virtual team members increase the complexity of leading virtually. The authors added that effective e-leaders are those able to create a culture where people are not afraid to speak up, be open-minded and provide feedback when necessary.

According to Albirini (2006), an individual may not use the technological tool when it does not fit within their micro- or macro-cultures. However, principals play a crucial role in changing the school culture (Fullan, 2003). According to Fullan (2003) if we are able to change the situation and context then there is a chance that we can change a person's belief and behaviour. The author added, "selecting and supporting good leaders is a crucial starting point for beginning to change the context in powerful, new ways" (p, 2). Thus, based on Fullan justification, a good school leader is able to change school culture. In this study, researcher assumed that principals' e-leadership is able to change school virtual learning culture and school virtual learning culture will influences teachers' attitudes toward using Frog VLE.

On the other hand, Yuen et al. (2003) conducted a case study of 18 schools in Hong Kong and identified three change models, based on three criteria: perceived roles and impact of ICT, vision, and values of ICT, and culture and history of change in the school. The authors stated that the impact and magnitude of change were profound when the school culture favored teacher and student empowerment. The authors noted that strategy adopted by a school in instituting such change and the resulting variation of pedagogical practices using ICT is strongly dependent on the school leaders' vision. Besides that, it also dependent on the school leaders' understanding of the role and impact of ICT in the curriculum, their goals and objectives for ICT integration, as well

as the history, culture, and background of the school and its general vision and mission. Thus, the leadership role of school principals not only plays an important part in shaping the responses to ICT innovation but also required the principal to have a clear direction and build positive school virtual learning culture.

This is further supported by Lackney (2005, p.523) documented that barriers such as organization culture may limit the willingness or understanding of teachers to fully integrate technology in schools even with support and funding from the government. In addition, Lackney (2005, p.524) stated that continuing assessing the effectiveness of the use of technology in schools is a critical ongoing task of school principals. The author added that for long-term strategic planning for successful implementation of ICT, steps such as making an audit of learning technology needs, knowing the status of the school district's technology infrastructure, and assessing how effectively technology serves school learning, instructions and operations are critical for school principals.

Chua & Chua (2017) research finding indicated that the quality of an e-leader is closely related with e-learning culture in school. Hence, it is confirmed that positive school virtual learning culture play an important part in ensuring great e-leaders in school and excellent e-leaders is very important in fostering positive e-learning culture in school.

Based on the literature reviews on this section, it was found that principals' e-leadership practices do have some impact on school virtual learning culture. However, the researcher found that there is still a lack of prior research that studies explicitly the indirect relationship between principals' e-leadership practices, school virtual learning culture and teachers' attitude toward using the Frog VLE. Hence, the researcher would

like to investigate the relationship between principals' e-leadership practices, school virtual learning culture and teachers' attitude toward using the Frog VLE in Klang district secondary schools.

2.4.4 Relationship between Teachers Computer-mediated Communication Competences (CMC) with Teachers' Attitude

Due to little empirical research focusing on computer-mediated communications and teachers' attitude toward the use of such resources for teaching and learning, Koszalka (2001) carried out a study to examine the effect of teachers' discussion on the use of ICT resources in teaching and learning through computer-mediated communication on teachers' attitude toward ICT resources usage in their classrooms. A post-test control group of 15 respondents and treatment group of 25 respondents was administered a set of attitude questionnaires and the results indicated that those who took part in the discussions possessed a higher level of attitude toward using ICT in the classroom and more likely to adopt ICT in their classrooms. Besides, as described in an adoption of innovations framework, it shows that peer support will lead to higher scores in attitude toward ICT usage. Furthermore, the study also provided empirical evidence of differences in attitude scores between similar groups of teachers who discussed integrating web resources in their classrooms and those who did not. According to Koszalka (2001), teachers whom actively involved in discussion group using computer-mediated communication may be an effective mechanism for promoting positive attitudes toward the use of web resources in the classroom thereby increasing the integration of such resources into teaching and learning environments.

In a study where Irfan Naufal & Mohamad Tarmizi (2014) intend to find out the levels of Malaysian teachers' ICT skills, namely, basic and advanced ICT skills,

Internet skills for information seeking and sharing as well as Internet skills for communication showed that respondents are highly competent in ICT for communication purposes. The authors stated that availability of various Internet communication applications such as email, chat rooms, Facebook, and other social networking sites might contribute to such findings.

In the year 2007, Samuel & Zaitun urged to examine whether if there is any suitable ICT infrastructure to facilitate teaching English language; to find out whether teachers have the adequate skills in using ICT infrastructure to teach English language; and to identify the barriers that influence the usage of ICT infrastructure to facilitate teaching English language in Malaysian schools. Based on 109 questionnaires that collected from five districts in Selangor which included Kuala Langat District, Hulu Langat District, Bangsar Area, Taman Dato Harun Area and Taman Melawati, results revealed that teachers generally lacked advanced ICT skill. Besides, interviews results from ten English language Department Heads revealed that besides the lack of ICT resources and poor ICT skills, teachers possessed negative attitudes and were generally unwilling to integrate ICT tools into the classroom. According to Samuel & Zaitun (2007), teachers' ICT related skills are crucial in implementing ICT into the classroom. This is because the more competent the teachers, there would be more ICT integrated activities in the classroom. In addition, the authors indicated that implementation of ICT in the teaching and learning need principals' full support and cooperation, teachers' positive attitude, and continuous training to update teachers' ICT skills, training on when, when not and how to use ICT tools appropriately. Further supported by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur (2012) stated that teachers' attitude, beliefs and their current level of knowledge and skills (CMC competence dimensions) toward ICT are the strongest barrier preventing them from using ICT. Hence, it is proved that teachers'

ICT skills, knowledge and attitudes are important factors in ensuring successful implementation of ICT in school.

Yunus (2007) collected both quantitative survey and semi-structured interviews data from ESL technical school teachers in Malaysia. Results indicated that majority of the teachers had positive attitudes toward using ICT in teaching ESL. Findings also stated that many teachers have access to a computer at home and have positive effects on teachers' attitudes to ICT including increased knowledge, confidence, and motivation. However, teachers are still lacking in ICT-related skills. Some of the teachers requested for training and provide expertise to render help with the basic issues and exploring possibilities during the interview session. Yunus's (2007) findings concluded that ESL teachers have the positive attitude but are still lacking in skills as they are not familiar with much new software and limited ICT infrastructure in school.

As we know, knowledge in ICT is a must among teachers and is an essential element in imparting knowledge to pupils (Kandasamy & Parilah, 2013). However, the authors found that many teachers do not acquire the necessary level of ICT related knowledge. Further supported by Rosnaini & Mohd Arif Hj (2010), in their study, results indicated that a minority group of teachers were knowledgeable in basic ICT and there were even a group of teachers demonstrated having very minimal knowledge of ICT. The majority of them only had average knowledge in ICT. This scenario clearly shows that the key factor in ensuring successful implementation of ICT programs in school is to upgrade the level of ICT knowledge among teachers (Kandasamy & Parilah, 2013). Besides, the authors added that another key factor in ensuring successful implementation of ICT programs in school is teachers' positive attitude toward ICT. Numerous studies show that there is a link between teachers' ICT-related skills, knowledge, motivation and

teachers' attitude toward using the ICT (Berner, 2003; Demetriadis et al., 2003; Gilakjani & Leong, 2012; Jegede et al., 2007; Juanna Risah et al., 2005; Koszalka, 2001; Lord & Brown, 2001; Rogers, 2003).

As we are now in ICT enabled economy, computer skills and knowledge have become more positively correlated with both occupational and personal success as many tasks involve human-computer interaction (Gilakjani & Leong, 2012). Hence, authors argued that both skills and knowledge are important in ensuring the success of a person. Gilakjani & Leong (2012) also indicated that attitudes are influenced by different variables including knowledge about computers, computer anxiety and liking, training, and computer experience. However, the authors stated that the impact of these factors on attitude toward computers often interact with one another and teachers' computer competencies significantly correlated with teachers' attitude toward using computers. Similarly, Berner (2003) collected quantitative survey data from five university/colleges in Virginia indicated that computer competence is the strongest predictor of teachers' computer use and it is a significant predictor of teachers' attitude toward using computers. Besides, Spitzberg (2006) indicated that it is not surprising that computer use is positively related to computer-related skills whereas experience with computer predicted web use. This is because as CMC technology use increases, individual's knowledge and skills should increase as well.

Further supported by Tezci (2010), the results conducted on 1540 primary school teachers found that their attitudes vary with their ICT-related skills and their levels of knowledge. It shows that both teachers' ICT-related skills and levels of knowledge do influence teachers' attitudes toward using the ICT to certain extend. "Teachers' attitude to adapt ICT mode of use is supported by research evidence that emphasizes the

situational character of knowledge and expertise" (Demetriadis et al., 2003, p.19). Additionally, according to Tezci (2010), the presence of ICT in the classroom creates a pressure and requires the effective use of ICT and it could also relate to teachers' attitudes and teachers' ICT-related knowledge. However, according to Juanna Risah et al. (2005), even teachers are equipped with knowledge and skills in using computers, the success of implementing the new curriculum with ICT in education depends greatly upon the attitudes of the teachers. Therefore, teachers should possess not only ICT knowledge and skills, but they must also have the right attitudes toward using the ICT.

On the other hand, Jegede (2007) conducted a study to identify the relationship between ICT competence and attitude of teachers. Through the administration of two research instruments to a total of 467 teachers randomly selected from 10 institutions (5 universities and 5 colleges of education), multiple regressions revealed that attitude significantly correlated with ICT competence and it is also a significant predictor of teachers' ICT competencies.

According to Spitzberg (2003), social transactions and communication are interchangeable ideas. Therefore, the transactions that contribute to the development of positive attitudes include communication should be related to the CMC competence of the teacher. Teachers' perceptions of both the CMC competence and their attitudes toward using Frog VLE must be measured in order to study the relationship between CMC competence and their attitudes toward using Frog VLE. Hence, in this study, the researcher argued that it is important to study teachers' perceptions of the CMC competence to understand better the potential role of CMC competence in the development of positive attitude toward using the technology.

Koszalka (2001) documented that changing teachers' attitudes involves a restructuring of their fundamental beliefs, feelings, ideas, and behaviours about what is important for student's learning. On the one hand, Baylor & Ritchie (2002) stated that teachers need prolonged exposure to new ideas and skills before teachers' attitude could change. Juanna Risah et al. (2005) suggest that being competent, having the right attitude, skills, and knowledge in using computers are important in ensuring high usage of ICT. On the other hand, Spitzberg (2006) indicated that teachers' positive attitude toward using the ICT can be indexed positively with teachers' motivation. As discussed earlier, knowledge, skills and motivation are three main components to measure teachers' CMC competencies in this study. Thus, in this study, researcher argued that teacher knowledge preparation for how to develop effective messages in the computer-mediated communication medium, skill training in the use of specific conversational tactics and strategies that are effective in facilitating online discussion and principal support for increasing teacher motivation can all positively affect teacher participation in online computer-supported discussion environments.

A study conducted by Juanna Risah et al. (2005) to measure teachers' perceived competence and attitudes toward ICT indicated that there is a significant difference between competent and incompetent teachers in terms of attitudes, which are usefulness, confidence, anxiety and aversion. In addition, teachers who are competent in using computers report that they find ICT more useful. They are more confident and have lower levels of anxiety and aversion compared to incompetent teachers. In their study, IT competencies dimensions measured were basic computer operation skills, word processing, preparing spreadsheets, telecommunication, and media communication. Findings indicated that teachers are not competent or cannot perform tasks in media communication and probably there are more technical areas that need to be learned by

teachers. Results documented that most of the participants were not able to perform a task in media communication compared to the other IT competence sub-domains. Therefore, proper computer training courses that emphasize skills in media communication should be given to improving the participants' level of IT competence in that particular skill the authors added.

According to Juanna Risah et al. (2005), hands-on experience on using technology tools could increase the user's positive attitudes toward computers and eventually increase their skills. In addition, the authors stated that teachers involved in their study are competent in using the basic computer operation skills because they have the knowledge to operate the systems. Besides, the authors also suggested that being competent and having the right attitude in using computers are favorable assets for professional teachers in motivating their preparedness toward using educational technology innovations. In this study, CMC competencies were measures from 3 dimensions namely: motivation, knowledge, and skills. Thus, from the above statement, the researcher assumes that there is a link between end user's skills, motivation, and knowledge with end user's attitudes toward using the ICT. The researcher expects that teachers CMC competencies would influence teachers' attitude toward using the Frog VLE. However, literature search found that there are limited current empirical studies that study explicitly the direct or indirect relationship between teachers' CMC competencies and teachers' attitudes toward using the ICT. Hence, researcher would like to examine the relationship between teachers' CMC competence and teachers' attitude toward using the Frog VLE in this study.

2.4.5 Relationship between School Virtual Learning Culture with Teachers' Attitude

Organizational culture is one of the key challenges which may enhance or hinder e-learning implementation in school (Hrastinski, Keller, & Lindh, 2009). However, teachers play a key role in the effective integration of technology for teaching and learning (Teo, 2015) and teachers' attitude determines the intention to use the technology (Qteishat, 2014). According to Ertmer & Ottenbreit-Leftwich (2010), teachers' attitude and beliefs, their content and pedagogic knowledge, and culture are the key variables in the successful implementation of ICT. Numerous studies stated that there is a link between school e-learning cultures and teachers' attitude toward ICT adoption (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Gathungu et al., 2015; Hrastinski et al., 2009; Jackson et al., 2008).

Hrastinski et al. (2009) argued that strategies for e-learning play a key role in shaping the organizational cultures, which in turn shapes e-learning use and development. The authors describe how the organizational culture shapes e-learning use at universities by comparing a School of Business and a School of Health Sciences using the concepts of administration-centered and learning-centered e-learning culture. Characteristics of both of the school e-learning cultures are different but both schools possessed positive attitudes toward e-learning use. School of Business regarded efficient administration as the key driver while not acknowledging the importance of e-learning for enabling collaborative learning whereas the School of Health Sciences, which have slightly more positive attitudes toward e-learning regarded collaborative learning as the key driver for e-learning while not acknowledging the importance of making administration efficient. Thus, it shows that there is a link between organizational culture and attitudes toward the use of virtual learning environment. According to Hrastinski et al. (2009), norms

inherent in the organizational culture could influence the behavioural and cognitive development of the peoples in the organization. Hence, organizational culture could be acute obstacle in implementation of ICT in schools. The authors also stated that the ideal organizational culture should value how e-learning can be used to not only enhance efficiency but also student learning.

Kollias, Mamalougos, Vamvakoussi, Lakkala, & Vosniadou (2005) collected qualitative data from fifty-six teachers, from four European countries, to ascertain their attitudes to and beliefs about the Collaborative Learning Environments which were designed under the Innovative Technologies for Collaborative Learning Project. Findings showed that the teachers were positive about Collaborative Learning Environments and their possible role and this positive perception held across cultures and national boundaries. The authors mentioned that those teachers who had adopted more progressive teaching practices over time felt that computers helped them change, but instead of acknowledging computers as a catalyst for change, they cited a culture of the school as a catalyst for change. Therefore, if teachers' positive perception on Collaborative Learning Environments able to raise their awareness with regard to the importance of the school culture toward educational innovation then it is acceptable to assume that Collaborative Learning Environments are particularly promising in facilitating teachers to adopt more progressive teaching practices. The authors also stated that new classroom culture influence teachers' acceptance of the technology and their attitude toward better planning and use. Similarly, Ertmer & Ottenbreit-Leftwich (2010) stated that teachers' belief and attitude is influenced by school culture and their beliefs can impact knowledge acquisition and use of ICT. Thus, based on both Ertmer & Ottenbreit-Leftwich (2010) and Kollias's et al. (2005) findings, it is proven that there is

a link between school culture and teachers' attitude toward the use of technologies innovations in school.

Demetriadis et al. (2003) in their paper entitled, " "Cultures in negotiation": Teachers' acceptance/resistance attitudes considering the infusion of technology into schools", mentioned that teachers are interested in using ICT to take advantage of any possible learning benefits offered by ICT but always in the context of the school culture. Besides, teachers are willing to explore open and communicative modes of ICT-based teaching whenever school objectives permit. Thus, it shows that teachers are willing to use ICT in teaching and learning only when the implementation of ICT is aligned with the school's objectives and school culture. It is thus acceptable to assume that school virtual learning culture will influence teachers' attitude toward using the Frog VLE as teachers' willingness to use ICT-based teaching is closely related to teachers' attitude toward the use of ICT in teaching and learning.

On the other hand, Ahmad Fauzi's et al. (2014) study explored the factors that influence the attitudes of 187 mathematic teachers from the state of Selangor in Malaysia in the integration of ICT in the teaching and learning process. Respondents were randomly selected from a stratified cluster sample. Teachers' technology competence, school culture, access to ICT, school support, and years of classroom teaching experience are the five factors that were postulated to impact teachers' attitudes toward the integration of ICT in their lessons. The findings showed that there is positive correlation between teachers' technology competence [$r = .41$; $p < .01$], ICT school culture [$r = .261$; $p < .01$], school support [$r = .366$; $p < .01$] and access to ICT resources [$r = .220$; $p < .01$] with teachers' attitudes toward using ICT in teaching and learning. However, years of teaching is negatively correlated with attitudes toward

using ICT in teaching and learning [r = −0.192; p < .01]. A multiple regression analysis showed that 29.1% of the variation in teachers' attitudes toward using ICT in the classroom was explained by the variation in teachers' technology competence, school support, and school culture, with the effects of teaching experience and ICT resource access being negligible. Hence, based on Ahmad Fauzi's et al. (2014) research findings, it shows that there is a significant relationship between teachers' technology competence and ICT school culture with teachers' attitudes toward using ICT in teaching and learning. Therefore, in this study, the researcher assumes that teachers CMC competencies and school virtual learning culture would influence teachers' attitude toward using the Frog VLE.

2.4.6 Effect of Teachers' Demographic Variables on the Relationship between Principals' Leadership Practices and Teachers' Attitude

Wanlabeh (2011) intended to examine the relationship between principals' transformational leadership practices and teachers' motivation in Songkhla, Southern Thailand. Data collected from 174 teachers from 6 selected Islamic private schools in Songkhla and found that teachers' gender, marital status, and age have an impact on their perceptions toward the principals' leadership practices. Similarly, Chang, Chin, & Hsu's (2008) findings showed that age and years of teaching experiences of teachers in Taiwanese elementary schools affect their perceptions toward their principals' technology leadership practices.

On the other hand, Tahir, Rahman, Yassin, & Ling (2010) aims to investigate the role of primary schools head teachers as an ICT leaders from the perspective of them being able to provide ICT infrastructures in school; able to motivate teachers to use ICT in school; able to encourage the use of ICT in school for school management purpose

and teaching and learning purposes. Data collected from 238 teachers found that schools head teachers demonstrated moderate level of ICT leadership practices in school. In addition, teachers' age, gender, and teaching experiences affect teachers' perceptions on head teachers' role as an ICT leaders.

Besides, Orr (1990) findings found that there is significant relationship between teachers' age, gender, and experiences and their perceptions toward female principals' leadership practices. Results also stated that there were significant different between male and female teachers' attitude and their perception toward female principals' leadership practices. Another similar study showed that there is a statistically significant difference between teachers' perceptions of principals' leadership with their years of teaching experience but there is no significant difference between teachers' perceptions and gender (Shouppe, 2005).

Leong et al. (2016) study aims to investigate the moderating effect of demographic variables (gender, age, educational level, teaching experience, and computer experience) on the relationship between principal technology leadership practices and teacher acceptance and use of school management system. Data collected from 417 teachers in Negeri Sembilan secondary schools showed that except teaching experience, other four demographic variables such as teachers' gender, age, educational level and computer experience are not the moderators on the relationship between principal technology leadership practices and teacher acceptance and use of school management system.

In conclusion, the amount of research on the proposed moderators (gender, age, teaching experiences, and computer experiences) on the relationship between principals' leadership practices and teachers' attitude has been rather limited. Hence, in particular,

this study was carry out to examine the moderating effect of gender, age, teaching experiences, and computer experiences on the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE.

Based on the discussion on the relationship between each of the main variables in this section, a summary of selected literature analysis of previous studies on attitude, e-leadership, CMC competence and school virtual learning culture are presented in Table 2.3.

Table 2.3: Selected Literature Analysis of Previous Studies on Attitude, E-Leadership, CMC Competence and School Virtual Learning Culture

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
A study of factors that may influence faculty in selected schools of education in the Commonwealth of Virginia to adopt computers in the classroom.	Berner (2003)	USA	64 samples	Quantitative survey	SPSS	Self-developed questionnaires	Computer competence is the strongest predictor of teachers' computer use and it is a significant predictor of teachers' attitude toward using computers
Attitudes and perceived information technology competency among teachers	Juanna Risah et al. (2005)	Malaysia	160 teachers	Quantitative survey	MANOVA	Adopted from previous studies	Teachers demonstrated high level of attitude and moderate level of ICT competence. There is a significant difference between competent and incompetent teachers in terms of attitudes, which are usefulness, confidence, anxiety and aversion.
Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics	Porter & Donthu (2006)	USA	539 students	Quantitative survey	LISREL 8.5	Adopted from previous studies	Beliefs about the Internet influence a consumer's attitude toward the use of the Internet. Attitude toward the Internet positively associated with the use of Internet.
Competence in computer-mediated communication: An evaluation and potential uses of a self-assessment measure	Bubas (2006)	Croatia	270 college students	Quantitative survey	SPSS	Spitzberg's CMC competence measure	CMC skills, knowledge, and motivation (CMC competence) influence end-users' attitude toward using SNS indirectly through the impact on effectiveness, appropriateness, understanding and satisfaction of SNS use

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Do teachers have adequate ICT resources and the right ICT skills in integrating ICT tools in the teaching and learning of English language in Malaysian schools?	Samuel & Zaitun (2007)	Malaysia	109 teachers, interview with 10 English language Department Heads	Mixed method (Survey and interview)	SPSS	Self-developed instrument	Teachers lacked of advanced ICT skills, possessed negative attitudes, and were generally unwilling to integrate ICT tools into the classroom. Principals' support, positive teachers' attitude and training are important factors in ensuring successful implementation of ICT.
Students' anxiety towards the learning of chemistry in some Nigerian secondary schools	Jegede (2007)	Nigeria	467 teachers	Quantitative survey	Multiple regression	Computer Competence Scale (CCOS) and Computer Attitude Scale (CAS)	Teachers' attitude significantly correlated with ICT competence and it is also a significant predictor of teachers' ICT competencies. Attitude components (affective and perceived usefulness) significantly predict ICT competence.
Culture, Gender and Information Technology Use: A Comparison of Chinese and US Children	Jackson et al. (2008)	US	600 Chinese and 600 US children	Quantitative survey	Multivariate analysis	Self-developed instrument	There are cultural and gender differences in ICT use between Chinese and US children. Cultures influence attitudes toward ICT.
Understanding structural and cultural school characteristics in relation to educational change: the case of ICT integration.	Tondeur et al. (2009)	Belgium	527 teachers from 68 Belgium primary schools.	Quantitative survey	One-way ANOVA.	Self-developed instrument	Technology integration is correlated to a school profile that reflects higher levels of cultural school characteristics. School clusters with strong cultural characteristics has significantly better ICT integration in classroom.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Principals' influences on teacher professional development for the integration of information and communication technologies in schools	Van Niekerk (2009)	South Africa	7 principals	In-depth interview	Atlas.ti	Self-developed instrument	Principals have the ability to enhance teachers skills and knowledge for effective ICT integration through teacher professional development
Singaporean and Taiwanese pre-service teachers' beliefs and their attitude towards ICT use: A comparative study	Chai et al. (2009)	Singapore and Taiwan	108 Singaporean and Taiwanese pre-service teachers	quantitative survey	Correlation test	Adopted from previous studies	Teachers' attitude towards ICT use does not correlated with their epistemological and pedagogical beliefs. Authority and expert knowledge dimension (competence) shows negative significant correlation with teacher attitude.
Factors affecting technology integration in k-12 classrooms: A path model	Inan & Lowther (2010)	Tennessee	1,382 public school teachers	Quantitative survey	Path model estimated using GEMINI software.	Teacher Technology Questionnaire (TTQ)	Teacher beliefs (attitude), readiness and availability of computer are a significant predictor of ICT integration. Overall support and computer proficiency (competence) is the strong predictor of ICT integration. Technical and overall support (leadership) positively impact teacher beliefs (attitude) and readiness.
Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect	Ertmer & Ottenbreit-Leftwich (2010)	USA	Not mentioned	Not mentioned	Content analysis	Not mentioned	Teachers' belief (attitude) is influenced by school culture and their beliefs can impact knowledge acquisition and use of ICT. Teachers' attitude and beliefs, their content and pedagogic knowledge, and culture are the key variables in successful implementation of ICT.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers	Tezci (2010)	Turkey	1540 primary school teachers	Quantitative survey	SPSS (t-test, one-way ANOVA, spearman 's rank order correlation test)	Adopted from previous studies	Teachers with different level of ICT related knowledge and skills (competence) possessed different level of attitude. Teachers demonstrated medium level of attitude but low level of ICT related knowledge. There is a significant relationship between teachers' attitude, knowledge, accessibility and frequency of ICT use.
Turkish primary school teachers' perceptions of school culture regarding ICT integration	Tezci (2011)	Turkey	1340 primary school teachers	Quantitative survey	One-way ANOVA	The ICT-Usage for Educational Purpose Scale, (3) The School Climate and Support (SCS) Scale	Teachers' possessed negative perception with regard to school culture (motivational and technical perspective). School culture and ICT use of teachers are moderately correlated. Gender, computer ownership, accessibility to Internet, teaching experiences and weekly computer use is significant predictor to school culture
A critical analysis of the challenges facing e-leaders in the 21st century: A review and comparison of the information and communication technology development of a public school and a public independent school in Hong Kong.	Lam & Woodhead (2012)	Hong Kong	Principal and the curriculum development officer of the local public school and the management team of the public independent school.	Mixed method case study (survey and interviews)	Not mentioned	Becta Self-Review (BSR) Framework, Becta survey	Look at e-leadership (leadership and management, resources, professional development, learning and teaching, assessment, students outcomes and extended learning) in the context of connectedness and life-long learning

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Principals' strategies for leading ICT integration: The Malaysian perspective	Kannan et al. (2012)	Malaysia	106 schools principals	Quantitative survey	Not mentioned	Principal Leading ICT Integration Questionnaire (PLICTQ)	School principals can inspire their teachers to enquire for more knowledge and skills (CMC competence dimensions)
Teacher beliefs and technology integration practices: A critical relationship	Ertmer et al. (2012)	USA	12 K-12 teachers	Multiple case study	Constant comparison method	Not mentioned	Teachers' attitude and beliefs and their current level of knowledge and skills are the strongest barrier preventing them from using ICT.
EFL teachers' attitudes toward using computer technology in english language teaching	Gilakjani & Leong (2012)	Malaysia	Not mentioned	Not mentioned	Content analysis	Not mentioned	Teachers' attitudes toward computer are influenced by different variables including knowledge and skills. Teachers' computer competencies significantly correlated with teachers' attitude toward using computers
The influence of computer-mediated communication (CMC) competence on computer-supported collaborative learning (CSCL) in online classroom discussions	Sherblom et al. (2013)	USA	91 students	Mixed method case study (survey and interviews)	Regression analysis	Spitzberg's CMC competence measure and Wrench and Punyanunt-Carter's computer apprehension measure.	CMC knowledge, skills, and CMC motivation of the computer-mediated communication competence are significant predictors of the attitude and students participation in online classroom discussion

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Investigating the perceived of e-leadership style change and its consequence in virtual context	Fan (2013)	Taiwan	130 undergraduate students	2x2x2 factorial experiment design through administration of survey questionnaires	ANOVA and MANCOVA	Not mentioned	E-leaders who guide their team members with more concerned, understanding, and empathy wordings through computer-mediated environment would not only increase members' willing to propose their ideas but also earn their respect, trust and satisfaction.
e-Leadership in higher education: The fifth "age" of educational technology research	Jameson (2013)	UK	Not mentioned	Quantitative survey	Not mentioned	Not mentioned	New leadership skills such as distributed and collaborative leadership are needed. Besides, interpersonal and intercultural skills in which the capacity to build high levels of trust and provide specific professional development and training opportunities in e-leadership is necessary.
E-leadership of School Principals: Increasing School Effectiveness by a School Data Management System	Blau & Presser (2013)	Northern Israel	8 secondary school principals, a Ministry of Education supervisor and a director of the school principals' training program	Qualitative (Semi-structured interviews)	Qualitative content analysis technique	Not mentioned	The authors recommend school principals to monitor teachers' activity within the system, delegate e-leadership responsibilities and adopt expanded-innovation model of implementation to enhance principals' e-leadership practices in school. School principal play vital role in initiating change in school culture toward technology use in school.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
School Leadership for ICT and Teachers' Use of Digital Tools	Ottestad (2013)	Norway	247 school leaders and 386 teachers from Norwegian primary and lower secondary schools	Quantitative Survey	Cronbach's alpha and factor analyses, bivariate correlations and linear regression (stepwise)	Not mentioned	School leadership for ICT including digital practice, ICT maturity, assessment and roles with ICT and leadership for collaboration. Results indicated that the indicators were correlated with the time teachers spend on ICT in the classrooms and for administrative use, their use of common digital tools and teachers' attitudes.
Effect of Principals' Leadership Style on Teachers' Attitude to Work in Ogun State Secondary Schools, Nigeria.	Adegbesan (2013)	Nigeria	Secondary school principals and teachers from Abeokuta south local government area	Mixed- method (Structure questionnaire and interview)	t-test and X^2 tests	Self-developed instrument	Principals leadership styles and behaviours influences teachers' working attitude significantly.
Knowledge, attitude and use of ICT among ESL teachers	Kandasamy & Parilah (2013)	Malaysia	50 teachers	Quantitative survey	SPSS	Not mentioned	Skill, knowledge, motivation, and attitude of teachers lead to limited usage of ICT in school. Teachers possessed positive attitudes but teachers do not acquire the necessary level of ICT related knowledge.
E-leadership effectiveness in virtual teams: Motivating language perspective	Fan et al. (2014)	Taiwan	107 students from two universities in Central Taiwan	2x2 with pre-test post-test factorial experimental design	Not mentioned	Not mentioned	The results show that leader's motivating language and feedback approach via e-mail instructions has different interaction effects on members' performance. Able to foster members' positive attitude and inculcate positive organization culture.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
Factors predicting teachers' attitudes towards the use of ICT in teaching and learning	Ahmad Fauzi et al. (2014)	Malaysia	187 mathematics teachers from Selangor, Malaysia	Quantitative survey	Multiple regression	Not mentioned	Teachers' technology competence, ICT school culture, school support and access to ICT resources had significant effect on teacher attitude. However, years of teaching is negatively correlated with attitudes toward using ICT in teaching and learning.
Effect of principals' technological leadership on teachers' attitude towards the use of educational technologies	Celep & Tülübaş (2014)	Turkey	320 secondary teachers	quantitative survey	Descriptive statistic and regression test.	"Technology Leadership Scale" and "Attitude toward Educational Technology Scale"	Teachers' perceptions on principals' technological leadership showed that school principals demonstrated high level of technological leadership practices and teachers possessed positive attitude toward educational technologies. Principals' technological leadership had little impact on teachers' positive attitude toward the utilization of ICT and it is not significantly correlated with teachers' negative attitude.
Twitter and E-Leadership in a Postsecondary Setting	Preston et al. (2014)	Canada	8 students	16 open-ended questions and 2 focus group inteerview	Not mentioned	Not mentioned	Student's attitude toward the assignment change when students embody e-leadership. Every stakeholder within the school community needs to assume the collaborative and reciprocal role of e-leadership for sustainable digital learning.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
The effect of e-leadership on organisational trust and commitment of virtual teams	Politis (2014)	United Arab Emirates	193 remote workers volunteered to participate	Quantitative Survey	SPSS and SEM	Self-developed instrument	E-leadership practices had a significant influence on the commitment of followers. The author highlights the need for virtual leaders to be adequately trained on virtual communication skills.
Model of E-Leadership, Intra-team Communication and Job Satisfaction among School Leaders in Malaysia	Mohd Yusri (2014)	Malaysia	879 school leaders in Malaysian	Online survey	SEM	Not mentioned	E-leadership significantly contributed to the intra-team, communication and it is also positively predicted towards job satisfaction.
Correlation between Cultural Perceptions, Leadership Style and ICT Usage by School Principals in Malaysia	Arokiasamy et al. (2015)	Malaysia	520 secondary school principals in the state of Selangor and Wilayah Persekutuan, Malaysia	Quantitative Survey	Not mentioned	Not mentioned	Principals have moderate competency in computer. Cultural perceptions and transformational leadership contributed significantly to the level of computer use. Cultural perception is essential for teachers' overall attitude toward ICT.
Principal Technology Leadership Practices and Teacher Acceptance of School Management System (SMS)	Leong et al. (2016)	Malaysia	417 secondary schools teachers	Quantitative survey	Multiple regression, SEM with AMOS	Self-developed instrument	Principals demonstrated high level of technology leadership and teachers show high level of acceptance and use of school management system. Principal technology leadership and teacher acceptance and use of the school management system are significantly correlated.

Table 2.3 continued

Title	Author (Year)	Country	Respondents/ Sample size	Design	Method / Analysis	Instrument	Findings
E-Leadership and Teacher Development Using ICT	Mishra et al. (2016)	USA	Not mentioned	Content analysis	Not mentioned	Not mentioned	Teachers and other stakeholders have to become sensitive to the cultural aspects of schools for successful e-leadership practices in education.
How are e-leadership practices in implementing a school virtual learning environment enhanced? A grounded model study	Chua & Chua (2017a)	Malaysia	22 school administrators, teachers, students, parents and software experts and 320 school administrators	Mixed method (semi-structured interviews & quantitative survey)	Semi-structured interviews using open and axial coding procedures & Quantitative survey using AMOS version 22	Self-developed instrument (Grounded theory)	Readiness, strategies and support had significant direct effect on e-leadership quality. Culture, practices, needs, and obstacles had indirect effect on e-leadership practices. Negative attitude, insufficient skills, knowledge, and training are obstacles of effective e-leadership practices.
Developing a grounded model for educational technology leadership practices	Chua & Chua (2017b)	Malaysia	20 leaders, teachers, students, and parents and 209 principals	Mixed method (semi-structured interviews & quantitative survey)	Semi-structured interviews using open and axial coding procedures & Quantitative survey using Smart PLS	Self-developed instrument (Grounded theory)	Teachers' CMC competence could help to build a positive relationship between principal and teachers and subsequently help to increase the usage of e-learning platform.
Do computer-mediated communication skill, knowledge and motivation mediate the relationships between personality traits and attitude toward Facebook?	Chua & Chua (2017)	Malaysia	327 school teenagers	Quantitative survey	SEM with AMOS	Adopted from previous studies	CMC skills, knowledge, and motivations significantly correlated with attitude. Mediating effects of skills, knowledge, and motivations occur in the relationships between four (neuroticism, extraversion, conscientiousness, openness to experience) of the five personality traits and attitude toward Facebook.

Theories supported that principals affect teachers' competencies and school culture which in turn affects teachers' attitude toward using ICT (House & Mitchell, 1971; 1975; Leithwood & Jantzi, 2006; Northouse, 2013). Based on Table 2.3, literature reviews support the notion that the presence of an e-leader, a strong school culture, and high teachers' ICT competencies positively impact teachers' attitude toward using ICT (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Berner, 2003; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008; Liaw et al., 2007). According Chua & Chua (2017a), an e-leader can impact the CMC competence of a teacher and the school virtual learning culture. Chua & Chua (2017) and Gilakjani & Leong (2012) stated that teachers' CMC competence (knowledge, motivation, and skills) is associated with teachers' attitude toward using ICT and it is proved that a positive school e-learning culture is linked to increased teachers' attitude toward using ICT (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008). Hence, based on Table 2.3, it is proved that these relationships are consistently statistically significant that teachers' CMC competence and school virtual learning culture can be used as a mediating variable when research is focusing on the relationship between school leaders' leadership practices and teachers' attitude toward using Frog VLE. In the next section, the researcher would like to present theoretical framework of this study.

2.5 Theoretical Framework

As discussed earlier, Jameson (2013) provides an updated framework of e-leadership skills and knowledge required in application of effective e-leadership to educational technology in higher education based on the work of Hollingsworth & Mrazek (2004) and Tan (2010) as well as both Heck & Hallinger (1999) and Leithwood et al. (2004)

that group key successful school organizational leadership categories into three main areas namely purposes, people and structures and social systems.

According to Leithwood et al. (2004), setting directions, developing people and redesigning the organization are the three sets of practices make up the basic core of successful leadership practices. Later, Leithwood & Jantzi's (2006) school-specific model of transformational leadership practices also build upon the three broad categories of leadership practices including setting directions, developing people and redesigning the organization. Firstly, setting directions are the dimensions building school vision, developing specific goals and priorities, and holding high-performance expectations. Secondly, developing people includes providing intellectual stimulation, offering individualized support and modelling desirable professional practices and values. Lastly, redesigning the organization includes developing a collaborative school culture, creating structures to foster participation in school decisions and creating productive community relationships.

Transformational leadership theory was brought and extended by Leithwood and his teams from James McGregor Burns into the field of education (Mees, 2008). Generally, transformational leaders could influence their follower's behaviour by providing vision and support; communicating high expectations; providing intellectual stimulation; act as role model and inspiring followers to change (Bass, 1990; Mees, 2008). Transformational leadership allows leaders to lead according to their own style in a different context as it provides a flexible approach to change (Bass, 1990). In order to accomplish change, the ability of a transformational leader to increase follower's commitment is necessary as the commitment of an individual influence their work productivity. Besides, teachers' commitment is affected by the motivation

transformational leaders instill. Those who can raise the level of commitment and motivation of teachers in a school are transformational leaders (Leithwood & Jantzi, 2006).

As we can see from the e-Leadership framework for educational technology in higher education by Jameson (2013) that categorised into three main areas such as purposes, people, and structures and social systems are similar with the transformational leadership model of Leithwood & Jantzi (2006) that categorised transformational leadership practices into setting directions, developing people and redesigning the organization. Thus, based on Leithwood & Jantzi's (2006) transformational leadership model as theoretical framework applied to this study, researcher make assumptions that the e-leadership practices of principals would influence teachers' attitudes toward using the Frog VLE. This is because according to Leithwood & Jantzi (2006) point of view, transformational leader's connect with the goals of followers, energize their enthusiasm and mental resources, raise their motivations and build their desire for collective individual mastery over the capacities needed to accomplish such goals. The authors believed that increased capacities, commitments and motivations are expected to bring about additional effort and greater productivity.

In view of Leithwood & Jantzi's (2006) framework, the authors assumed that for large-scale reform to accomplish its own objectives, school staffs must be propelled to react to the change in some locally meaningful and gainful way. The six variables that constitute the framework of Leithwood & Jantzi (2006) study and their relationships are as shown in Figure 2.7. The authors added that it is also important that school leaders provide opportunities for teachers to develop necessary knowledge and skills to accomplish school goal. According to Spitzberg (2006), "skills are the repeatable, goal-

oriented behavioural tactics and routines that people employ in the service of their motivation and knowledge" (p. 638). Besides, the author added that motivation and knowledge is not sufficient unless individuals have the necessary skills to transform their motivation and knowledge into action. This metaphor is mirrored in older metaphors of affective, cognitive, and behavioural factors of action and was later imported as a way of organizing research on communication competence including the current models of CMC competence by Spitzberg (2006). It shows that CMC competence of an individual plays an important part in helping to translate their motivation, knowledge, and skills into affective, cognitive, and behavioural factors of action. Hence, in this study, the researcher make the assumption that principals' e-leadership will influence teachers' CMC competencies and CMC competencies of teachers will influence teachers' attitudes toward using Frog VLE from the affective, cognitive, and behavioural dimension of attitude.

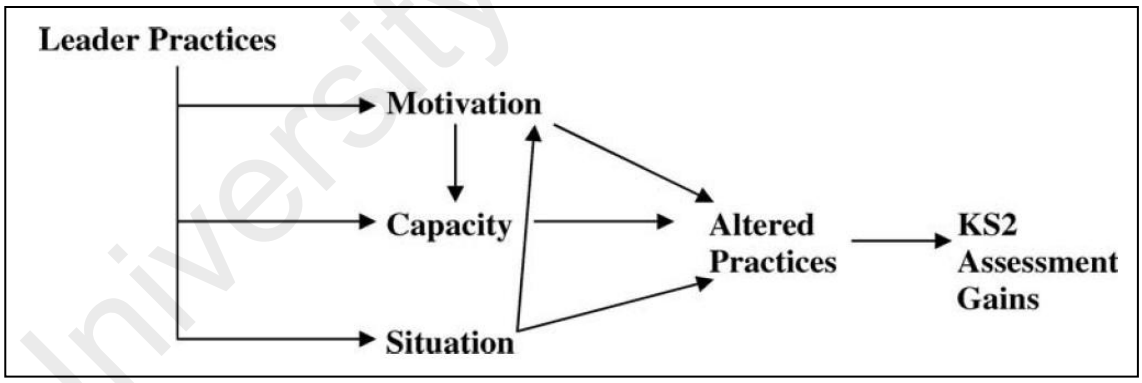

Figure 2.7: Explaining Leaders' Effects on Teachers and Their Practices (Leithwood & Jantzi, 2006, p. 204)

Teachers' capacities, motivations, and their work settings significantly influence their classroom practices in school (Leithwood & Jantzi, 2006). School settings and the environment in which school staffs work play an important role in developing their motivation and capacity. Therefore, it is reasonable to presume that school virtual

learning culture will have a direct effect on teachers' attitudes toward using the Frog VLE based on Leithwood & Jantzi (2006) findings. In addition, Leithwood & Jantzi (2006) indicated that there are direct effects and indirect effects between transformational school leadership practices and teachers' practices. The indirect effects can be realized through leaders' on teachers' motivation, capacity and work settings. Hence, based on this point of view, it is assumed that principals' e-leadership practices will have direct effects on teachers' attitude toward using the Frog VLE and the indirect effects being acknowledged through leaders' on teachers' motivation, capacity, and work settings such as teachers' CMC competence and school virtual learning culture.

By having transformation leadership style, school principals today are able to unite the interest of all the school stakeholders including administrators, teachers, students, parents and community (Sujo-Montes & Gallagher, 2011). In addition, Avolio, Walumbwa, & Weber (2009) stated that transformational leadership was positively associated with intervening variables and performance outcomes. Recently, the authors added that there are researches examining the boundary conditions where followers' attitudes and behaviours could be predicted more effectively by leaders' transformational leadership. Thus, it is relevant as the theoretical framework for this study as researcher aims to examine teachers' attitudes toward using the Frog VLE. Basically, transformational leadership theory was used to study the effects of leader behaviour on followers' empowerment, performances, commitment and motivation (Mees, 2008). On the other hand, e-leadership was defined as "a social influence process mediated by AIT to produce a change in attitudes, feelings, thinking, behaviour, and/or performance with individuals, groups, and/or organizations" (Avolio et al., 2000, p.617).

Hence, both transformational leadership theory and e-leadership theory was used to study the effects of leader's behaviour on follower's attitudes, behaviours, and performance. Building upon Leithwood & Jantzi's (2006) transformational leadership model, the researcher assumed that principal e-leadership practices will have an effect on teachers' attitudes toward using the Frog VLE. This is further supported by He (2008), in his study of virtual organization's and team's e-leadership strategy. Findings suggest transformational leadership style has more positive effect on trust and team performance in virtual settings. In addition, Purvanova & Bono (2009) proven that most effective virtual leaders are those with higher transformational leadership. Besides, Hambley, O'Neill, & Kline (2007) indicated that transformational leadership styles are effective in virtual settings in which effective communication between the e-leader and team members that in turn expand their constructive interactions and influence their performance subsequently.

In this study, teachers' computer-mediated communication competence and school virtual learning culture act as a mediator of the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE. According to Leithwood & Jantzi (2006), transformational school leadership has both direct and indirect effects on teachers' practices. Thus, by referring to Leithwood & Jantzi (2006) theory, the researcher makes the assumption that teachers' computer-mediated communication competence and school virtual learning culture will have indirect effects on teachers' attitudes toward using the Frog VLE. Further supported by Northouse (2013) documented that path-goal theory suggests that if followers think they are capable or felt competent of performing their work, they will be motivated. Therefore, leaders should provide support in term of the necessary skills, knowledge and competence to subordinate to achieve the desired goal. In addition, according to George

& Sleeth (2000), being able to motivate members in an organization through goal clarification and roadblock reduction as what stated in Path-Goal Theory is an important competence for leaders in a technology-mediated environment.

Based on path-goal theory, a leader is effective due to their ability to change subordinates' motivation, satisfactions and capacity to perform effectively (House, 1971; House & Mitchell, 1975)**.** House & Mitchell (1975) indicated that an effective leader's able to increases subordinate goal attainment and clarifies the paths to these goals. The path-goal approach is derived from a motivational theory called expectancy theory. Generally, expectancy theory stated that an individual's attitudes such as job satisfaction or behaviour can be predicted from two concepts. Firstly, predicted from the degree to which the job, or behaviour, is seen as leading to various outcomes (expectancy). Secondly, predicted from the evaluation of these outcomes (valences). Therefore, if individuals presumed that their work will lead them to the things that they highly valued, then they will work hard and be satisfied with it. Based on House & Mitchell (1975), this kind of theoretical rationale can be utilized to anticipate an assortment of phenomena related to leadership including how leader behaviour influences subordinate motivation or attitude.

House & Mitchell (1975) urged to discover how the leader influences subordinates' expectations that effort will prompt to effective performance and valued rewards, and how this expectation influences motivation to work hard and perform well. With respect to environmental variables, the theory stated that leader behaviour help to motivate followers to cope with environmental uncertainties and threats and it is predicted to raise follower's expectations that their effort will be rewarded.

On the other hand, Northouse (2013) indicates "path-goal theory emphasizes the relationship between the leader's style and the characteristics of the subordinates and their work setting" (p. 137). Thus, by referring to path-goal theory, besides providing information and support necessary to obtain the desired goal, other resources such as create a positive work environment or work setting including inculcate positive school virtual learning culture for the team is also important. According to Gathungu, Iravo, & Namusonge (2015), culture represents an aspect of the organizational environment that impacts several organizational outcomes such as ethical behaviour, commitment, productivity, and performance. In addition, the leader's leadership style majorly affects the development of the organization's culture. In fact, leader's beliefs, values, and assumptions shape the culture of the organization and later educated to different individuals from the organization. In educational settings, Schiller (2003) expressed that by adopting a dynamic approach to innovation, principals can create an environment that benefits both students and staff.

Furthermore, literature review showed that principals' e-leadership practices are believed to have an influences on teachers' skills, knowledge and motivation (CMC competence dimensions) toward using ICT (Chua & Chua, 2017a; Kannan et al., 2012; Lord & Brown, 2001; Mwawasi, 2014; Van Niekerk, 2009; Zaccaro & Bader, 2003). Besides, given that there is evidence of the relationship between principals' e-leadership practices and school virtual learning culture (Blau & Presser, 2013; Chua & Chua, 2017a). There are evidence proved that there is a link between teachers' ICT-related skills, knowledge, motivation (CMC competence dimensions) and teachers' attitude toward using the ICT (Berner, 2003; Demetriadis et al., 2003; Gilakjani & Leong, 2012; Jegede et al., 2007; Juanna Risah et al., 2005; Koszalka, 2001; Lord & Brown, 2001; Rogers, 2003) and there is a link between school virtual learning culture

and teachers' attitude toward ICT adoption (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Gathungu et al., 2015; Hrastinski et al., 2009; Jackson et al., 2008). There is also evidence showed that there is a link between principals' e-leadership practices and teachers' attitude toward using the ICT (Aarons, 2006; Adegbesan, 2013; Avolio et al., 2000; Avolio et al., 2009; Fan et al., 2014; Hambley et al., 2007; He, 2008; Kelloway et al., 2003; Kim, 2011; Kursunoglu & Tanrıogen, 2009; Lai & Yin, 1997; Liaw et al., 2007; Ling & Mohammed Sani, 2013; Mees, 2008; Ottestad, 2013; Preston et al., 2014).

Hence, in this study, the researcher would make assumptions that principals' e-leadership practices are able to enhance teachers' computer-mediated communication competence and school virtual learning culture. Besides, both teachers' computer-mediated communication competence and school virtual learning culture influence teachers' attitudes toward using Frog VLE indirectly. It is also important to realize that there are many different points of view on leadership practices and many ways to lead successfully. Based on the assumptions made, in this study, the researcher frames the theoretical framework for this study to investigate whether principals' e-leadership practices have a direct influence on teachers' attitudes toward using the Frog VLE or have an indirect influence which is mediating by teachers' computer-mediated communication competence and school virtual learning culture. The researcher will apply the integrated theory of path-goal to explain the theoretical framework among variables of this study. The theoretical framework of this study is as shown in Figure2.3.

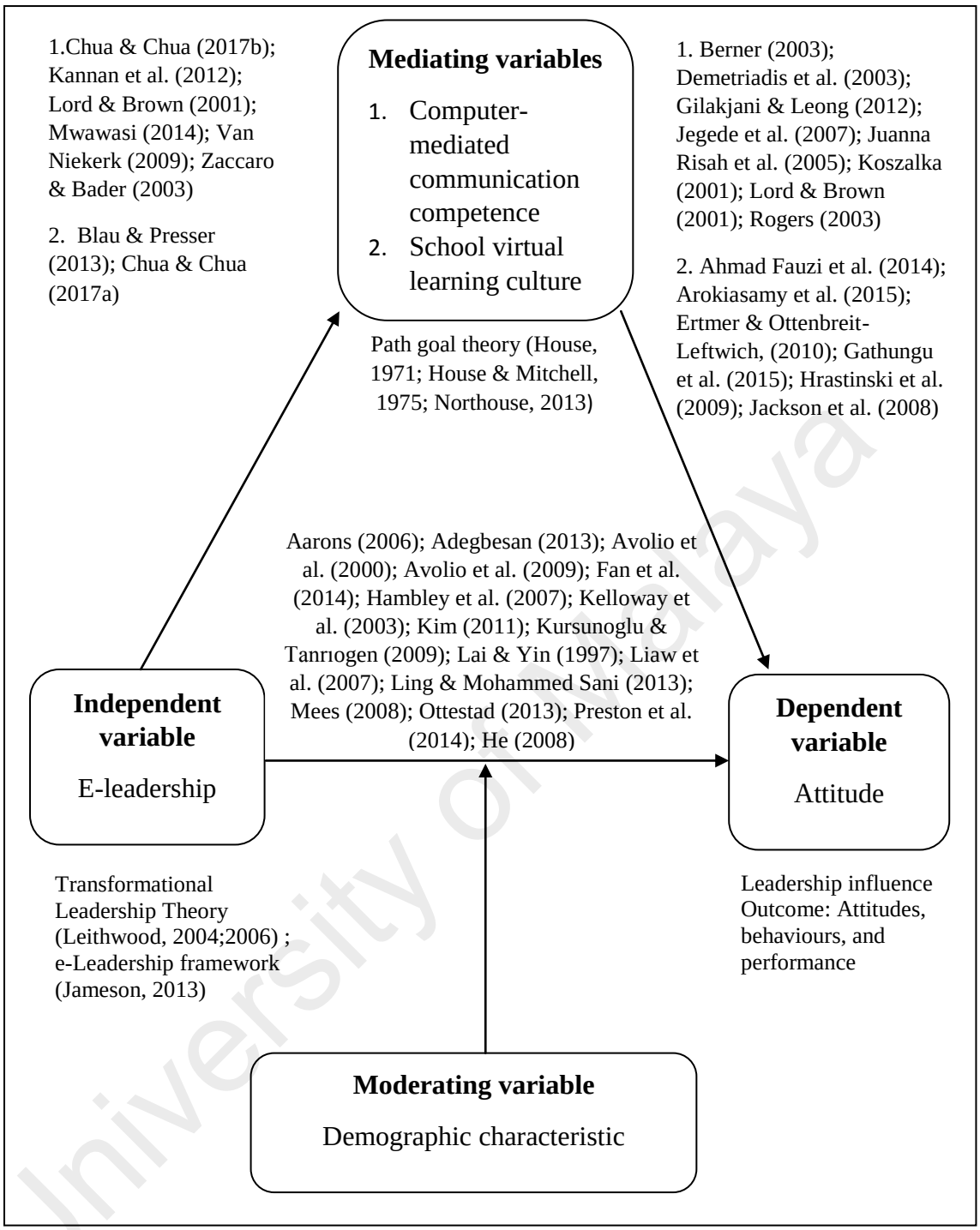

Figure 2.8: Theoretical Framework of the study

After the discussion on the relationship between each of the main variables in section 2.4.1 to section 2.4.6 and the theoretical framework, a conceptual framework of this study is built and are presented and discussed in the following section. The theoretical framework serves as the basic of establishing the conceptual framework of this study.

Besides, by referring to the literature in Table 2.3, the findings from studies investigating e-leadership practices, CMC competencies and school virtual learning culture's impact on teachers' attitude toward using Frog VLE are contradicting regardless of time, research design, method, instrumentation and attitude variables. In addition, a thorough review of the literature found no appropriate survey instrument that would examine all the factors indicated in this study, hence, researcher search for suitable survey instruments yielded several possibilities for investigating several factors and will be further discussed in Chapter 3 together with the methodology of the study.

2.6 Conceptual framework

Based on previous research and the theoretical framework, conceptual framework of this study is build and is as shown in Figure 2.9. In the framework, there are five main variables which are (i) teachers' attitude toward using the Frog VLE; (ii) principals' e-leadership practices; (iii) teachers' CMC competencies; (iv) school virtual learning culture; and (v) teachers' demographic characteristics.

Based on the conceptual framework of the study, the independent variable of this study is principals' e-leadership based on three different dimensions such as purposes, people and structures and social systems whereas the dependent variable of the study is teachers' attitude toward using the Frog VLE that describe the three aspects such as affective, cognitive and behavioural.

From an extensive review of the literature, teachers' computer-mediated communication competence and school virtual learning culture is influenced by principals' e-leadership and also influence teachers' attitude toward using the Frog VLE. Thus, both teachers' CMC competence and school virtual learning culture are suggested

as the mediator of this study on the relationship between principals' e-leadership practices and teachers' attitudes toward using the Frog VLE. Teachers' CMC competence comprised of three dimensions namely: (i) motivation; (ii) knowledge; and (iii) skills based on the component model of CMC competence measure by Spitzberg (2006). School virtual learning culture comprised of two dimensions such as (i) values and (ii) beliefs. Teachers' demographic characteristics are suggested as the moderator on the relationship between principals' e-leadership and teachers' attitude toward using the Frog VLE of this study.

As we know, effective leadership is determined by the selection of the leadership style that is appropriate to the needs of the followers. Teachers' CMC competence and school virtual learning culture is influence by principals' e-leadership practices. Teachers' attitudes are a result of teachers' CMC competence and school virtual learning culture within the conceptual framework of the study. The relationship between principals' e-leadership, teachers' CMC competence, school virtual learning culture, teachers' demographic characteristics and teachers' attitude toward using Frog VLE are as shown in Figure 2.9: Conceptual Framework of the Study.

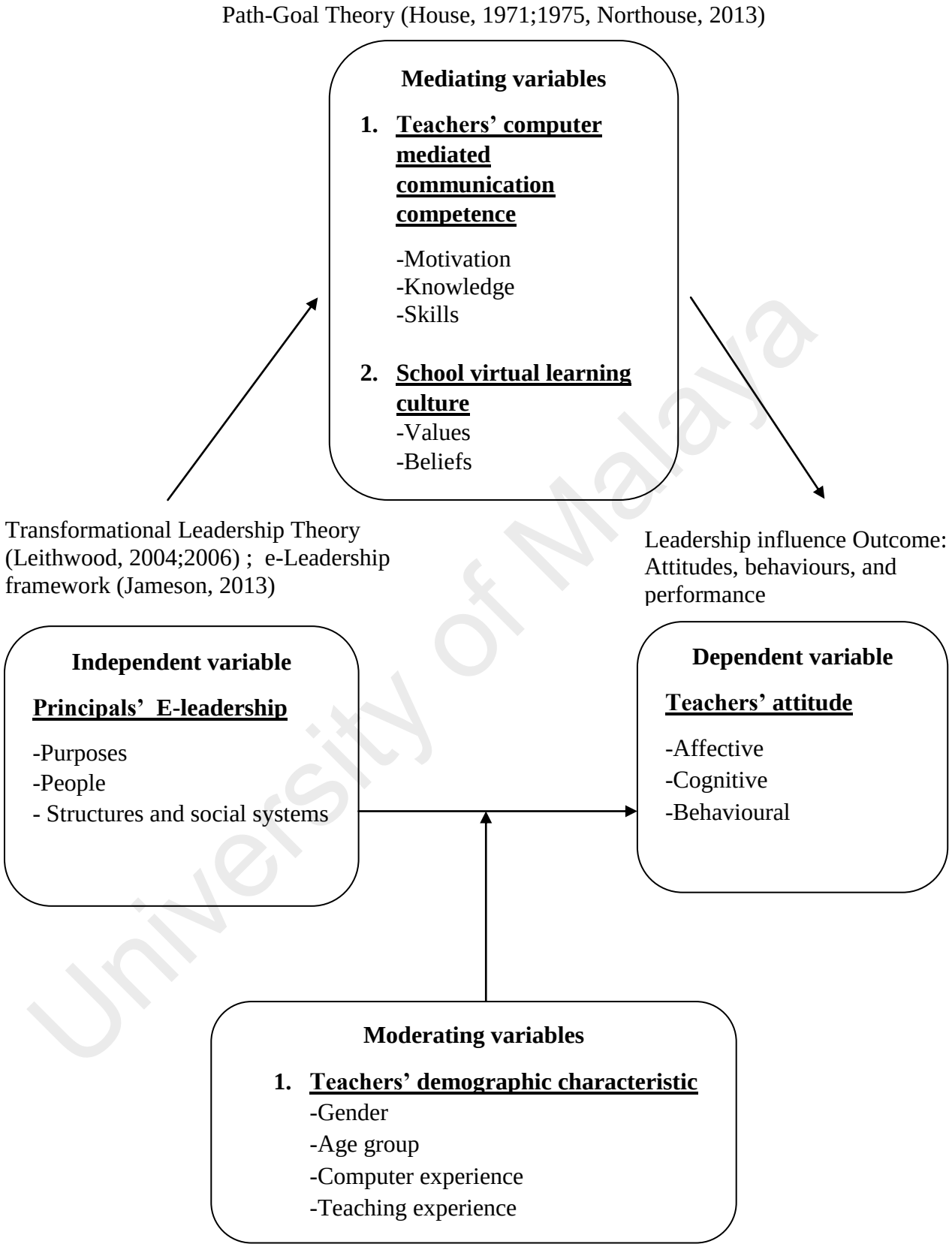

Figure 2.9: Conceptual Framework of the Study

2.7 Summary

This chapter provided an overview of literature relevant to the study. The literature review section starts with relevant theories and models related to e-leadership. Subsequently, relevant theories and models related to computer-mediated communication (CMC) competence and teachers' attitude are presented. Following that, current studies on teachers' attitudes toward using Frog VLE, principals' e-leadership practices, teachers' CMC competencies, school virtual learning culture and teachers' demographic characteristics are discussed in detail. Each of these five main variables is reviewed critically before the constructions of the measurement models for the dimensions which explained these five latent variables. Next, contemporary studies related to the relationship between principals' e-leadership practices with teachers' attitude toward using Frog VLE, school virtual learning culture and teachers' CMC competencies are discussed. Subsequently, contemporary studies related to the relationship between teachers' CMC competencies and school virtual learning cultures with teachers' attitude are presented as well. All the findings are compared, contrasted and reviewed critically in this chapter followed by the discussion on the theoretical framework of this study. Finally, an overview of the conceptual framework proposed for this study is presented based on the convergence of these empirical studies, relevant theories and theoretical framework that are reviewed. In the following chapter, chapter 3 will discuss and provides the methodology and design of the study.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes and discusses the methodology related to the study. This includes the research design of the study, description of the population and sampling procedures, the development of the research instruments, pilot study, data collection procedures and data analysis according to the research questions. The literature review and the conceptual framework presented in Chapter 2 together with the methodology outlined in this chapter indicate the approach to address the research questions listed in Chapter 1.

3.2 Research Design

This is a non-experimental research using survey technique through the administration of questionnaire that has been developed for data collection. According to Johnson & Christensen (2008), the non-experimental researcher cannot directly manipulate the independent variable or randomly assign research participants to experimental control groups. Creswell (2014) noted that non-experimental approach does not lead to a causal relationship rather it helps to explain the relationships between variables and describe trends in the data. This is a non-experimental research where researcher aims to investigate the relationship between principals' e-leadership practices, teachers' computer-mediated communication competence, school virtual learning culture and teachers' attitudes toward using the Frog VLE without manipulating the principals' e-leadership practices.

Quantitative research method will be applied in this study to explain how one variable affects another (Creswell, 2012) or to explain the relationship between the

variables (Fraenkel, Wallen, & Hyun, 2012). Muijs (2011) stated that survey research is well suited to descriptive studies, or where the researcher wants to look at the relationship between variables occurring in particular real-life contexts. Both Gay & Airasian (2000) and Johnson & Christensen (2008) stated that descriptive research also referred to as survey research which mainly concerned with attitude, opinions, preferences, demographics, practices and procedures. According to Chua (2012), survey research can be used widely to answers various kinds of research questions concerning issues and problems from multiple perspectives especially in explaining attitudes, views, beliefs, feelings and behaviour. In addition, the author stated that descriptive data are usually collected by questionnaire, interview, telephone, or observation.

On the other hand, Shaughnessy, Zechmeister, & Zechmeister (2012) mentioned that surveys are often used in correlational research, and correlational research is an excellent method for meeting the scientific goals of description and prediction. Surveys are also used to assess changes in attitudes or behaviours over time and to determine the effect of some naturally occurring event (Shaughnessy et al., 2012). In this study, the survey was a means of collecting self-reported data at a specific point in time with the purpose of (1) describing the dependent variable of interest and (2) examining the relationship between the dependent variable and independent variables with mediator and moderator of the study. Specifically, this study aims to describe the attitudes of teachers toward using Frog VLE and also examining the relationship between the principals' e-leadership practices and teachers' attitudes toward using Frog VLE with teachers' computer-mediated communication competence, school virtual learning culture, and teachers' demographic characteristics.

A cross-sectional and self-administered questionnaire will be data collection tool for this research design. According to Creswell (2014); Gay, Mills, & Airasian (2011) and Shaughnessy et al. (2012), cross-sectional survey design is the most popular form of survey design used in education setting where one or more samples are drawn from the populations at one time. In addition, this design has the advantages of measuring current attitudes, beliefs, opinions, or practices (Creswell, 2014) and to make predictions or to provide good descriptions of the population at that time data collected (Shaughnessy et al., 2012). Besides, according to both Muijs (2012) and Chua (2012), another advantage of survey studies is that researcher are able to gather large amounts of data at a reasonably low cost and effort compare to other methods. Further supported by Creswell (2014) indicated that in examining attitude's of individual requires a cross-sectional study at one point in time to assess attitudes immediately and quickly.

In addition, Straub (2009) stated that decision for adopting an innovation can be a one-time event because individual's beliefs and attitudes are formed over time and this could, in turn, influence their decisions on the innovation of adoption behaviour. Based on this justification, this study on examines teachers' attitude toward using Frog VLE in Klang district daily public secondary schools could be conducted as a cross-sectional study. Furthermore, cross-sectional designs are ideally suited for the descriptive and predictive goals of survey research. Therefore, this method is appropriate for this quantitative study where researcher needs to gather large amounts of data and involve a large number of samples in order to answer the research objectives and to examine the attitudes of teachers toward using Frog VLE.

3.3 Population and sample of the study

Population refers to the entire group which will be studied (Chua, 2012); a group of individuals who have the same characteristic Creswell (2014); and is the group researcher want to generalize the findings (Muijs, 2011). On the other hand, Dimmock & Lam (2000) defined population as the group of peoples or things researcher want to reach a conclusion about. The target population for this study was comprised of all daily public secondary school teachers in Klang district, Selangor, Malaysia. The reason why Klang district is chosen for this study is due to the statistics and data obtained from the District Education Office (PPD) Klang regarding FrogVLE usage. The data obtained showed that Klang district is one of the top PPD in Selangor state that achieved their key performance indicators in FrogVLE usage.

According to Klang District Education Office, there are total 39 daily public secondary schools with a total of 4290 teachers in Klang district, Selangor, Malaysia. However, five *Sekolah Agama Menengah*, *Sekolah Agama Menengah Tinggi*, and *Kolej* are excluded from the target population as they have different setting and context as compared to other daily public secondary schools in Klang district. Hence, 34 daily public secondary schools in Klang district, Selangor, Malaysia will be the target population of this study with a total of 3931 teachers. The aim of the study is to investigate teachers' perception on the level of principals' e-leadership practices, teachers' computer-mediated communication competence, school virtual learning culture and teachers' attitude toward using the Frog VLE. Thus, the respondents being studied are the individual teacher.

As a guideline, researcher referred to the Krejcie and Morgan's sample size determination table to determine the sample size of this study. According to Krejcie &

Morgan (1970), based on the total number of teachers (3931 teachers) in the target population of this study, the minimum number of respondents needed for this study at 95% confidence level is 351 teachers. Krejcie & Morgan's (1970) table for determining sample size from a given population is shown in Table 3.1.

Table 3.1: Krejcie & Morgan's Sample Size Determination Table (Chua, 2012, p.227)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: N is population size; S is sample size

A total of 34 daily public secondary schools in Klang districts, Selangor will be the target population of this study. All the 34 daily public secondary schools in Klang districts, Selangor will be labeled as School A1 to School A34. The minimum number

of teachers needed from each of the schools will be calculated based on the number of teachers from each school divided by the total number of teachers in Klang district and multiply by the number of samples needed. In this study, the number of samples needed is 351 teachers and the total number of teachers is 3931 teachers. Figure 3.1 shows the mathematical expression to determine the samples needed from each school and Figure 3.2 is an example of calculation for School A2. If the minimum number of teachers required for each school is not a whole number then the researcher will round off the specific number into highest and lowest rounded whole number. For example, the minimum number of teachers needed from School A2 is 14.7, then, the highest rounded whole number is equal to 15.

As we know, the sampling error is unavoidable in the process of selecting subjects from the population for a research study (Chua, 2012). Creswell (2014) stated that by increasing the sample size, the sampling error of a statistic decrease. Thus, selecting more respondents than the minimum sample size will produce a higher rate of return and reduce the sampling error.

In this study, to avoid the situation where researcher receive void responses where the questionnaire collected are not complete or wrongly filled that will cause the response rate to be lower than 100%, the researcher decided to increase the number of questionnaire given to each school. In order to ensure the data is adequate, the researcher adds 3 to the minimum number of teachers selected from each school. For instances, if the minimum number of teachers selected from School A2 is 15 then the actual number of the teachers selected from School A2 is 15 plus 3 which is equal to 18. The minimum number of teachers needed as samples from each school and the actual number of teachers selected from each school are as shown in Table 3.2.

$$\text{Number of teachers needed from each school} = \frac{\textit{No of teachers in such school}}{\textit{Total number of teachers}} \times 351$$

Figure 3.1: Mathematical Expression to Determine the Samples Needed

$$\text{Number of teachers needed from each school} = \frac{165}{3931} \times 351 = 15 \text{ teachers}$$

Figure 3.2: Examples of Calculation for School A2

Table 3.2: Minimum Number of Teachers Needed as Samples and Actual Number of Teachers selected from Each District

No	Schools	Number of teachers	Minimum number of teachers needed	Actual number of teachers selected
1	A1	80	7	7+3=10
2	A2	165	15	15+3=18
3	A3	86	8	8+3=11
4	A4	132	12	12+3=15
5	A5	94	8	8+3=11
6	A6	112	10	10+3=13
7	A7	74	7	7+3=10
8	A8	133	12	12+3=15
9	A9	38	3	3+3=6
10	A10	75	7	7+3=10
11	A11	100	9	9+3=12
12	A12	166	15	15+3=18
13	A13	142	13	13+3=16
14	A14	153	14	14+3=17
15	A15	66	6	6+3=9
16	A16	270	24	24+3=27
17	A17	105	9	9+3=12
18	A18	102	9	9+3=12
19	A19	81	7	7+3=10
20	A20	31	3	3+3=6
21	A21	78	7	7+3=10
22	A22	128	11	11+3=14
23	A23	166	15	15+3=18
24	A24	134	12	12+3=15
25	A25	130	12	12+3=15
26	A26	46	4	4+3=7
27	A27	72	6	6+3=9
28	A28	173	15	15+3=18

Table 3.2 continued

No	Schools	Number of teachers	Minimum number of teachers needed	Actual number of teachers selected
29	A29	112	10	10+3=13
30	A30	155	14	14+3=17
31	A31	132	12	12+3=15
32	A32	123	11	11+3=14
33	A33	141	13	13+3=16
34	A34	136	12	12+3=15
	Total	3931	352	454

In order for the researcher to be able to generalize, the researcher needs to have an unbiased sample of the population and the best way of ensuring that the sample is unbiased is by using probability sampling method (Muijs, 2011). Besides, Chua (2012) and Gay, Mills, & Airasian (2011) stated that probability sampling allowed every subject to have equal probability and independent chance to be selected from the population. In addition, Chua (2012) indicated that random sampling, one of the probability sampling procedures is important as the sample chosen randomly from a population will represent the population being studies.

On the other hand, Johnson & Christensen (2008) mentioned that the most frequently used method in quantitative survey research is random sampling where the researcher goal is to understand the characteristics of a population. Therefore, simple random sampling procedure will be used to select teachers as respondents for this study from each of the selected schools. Upon obtaining the consent from the school principals, the name lists of teachers from each of the school were collected. The names of the subjects were first identified from the respective school teachers' name list using the simple random sampling procedure. A total of 454 daily public secondary school teachers were randomly selected to participate in this study.

According to Table 3.2, the actual number of teachers selected from each school is in the range of 6 teachers to 27 teachers. According to Brown (1967), a random selection of between 4 to 10 teachers in a school was adequately representative of the feelings and perceptions of the entire school. Therefore, the actual number of teachers selected by the researcher as shown in Table 3.2 was adequately representative of the population.

Additionally, in determining the size of the sample for a descriptive study, Gay & Airasian (2000) suggested that by using 10-12% of the population is sufficient to carry out the research. Since 34 daily public secondary schools are selected from the target population and a total of 454 daily public school teachers were selected to participate in this study. The sample size is approximately 11.55% (454 teachers) of the teacher population (3931 teachers) in 34 daily public secondary schools in Klang district. Hence, based on Gay & Airasian (2000) justification, the samples selected in this study is sufficient. Besides that, Guetterman (2015) stated that before beginning the study, the researchers will calculate the required sample size and the sample size remains a constant target throughout the study. In this study, the required calculated sample size of the target population remains constant throughout the study. In the following section, a summary of sampling design is as shown in Figure 3.3.

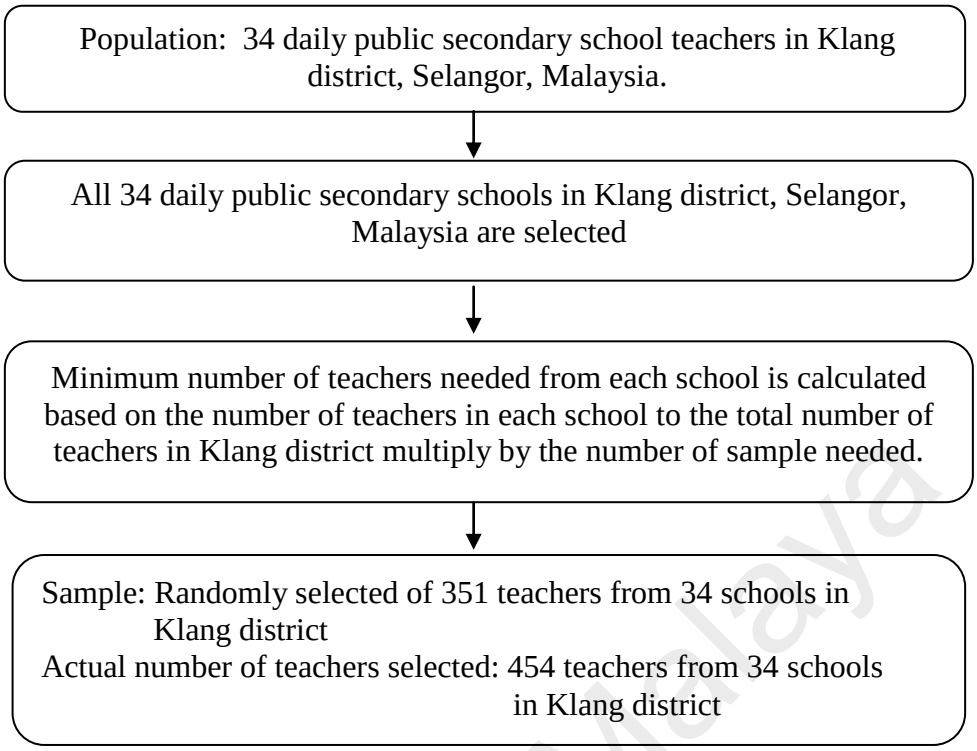

Figure 3.3: Sampling Design

3.4 Instrumentation

Creswell (2014) stated that an instrument is a tool to measure and to document quantitative data that contains specific questions and response possibilities that are established or developed by the researcher before the real study. The instrument used in this study was adapted from various established findings based on quantitative research and developed by the researcher by referring to various studies. A questionnaire will be developed by the researcher as an instrument to obtain information needed for the study because this study applied quantitative research method to explain the relationship between variables.

The instrument designed in this study contained five sections, namely, (a) teachers' demographic characteristics as moderating variable, (b) principals' e-leadership practices as an independent variable, (c) teachers' attitude as dependant variable, and (d)

teachers computer-mediated communication competence and (e) school virtual learning culture as mediating variables. The descriptions of the parts are discussed as follows:

3.4.1 Teachers' Demographic Characteristics

Based on literature reviewing, the researcher found that there are few teachers' demographic characteristics which have some effect on teachers' attitude. Gender, age group, computer experience and teaching experiences are selected antecedents of teachers' attitude shown in prior studies. Therefore, the researcher believes that these demographic characteristics will thus influence the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE in Klang district. These variables are listed in Section A of the instrument of this study.

Information on respondent's demographic background was collected in the form of nominal data. According to Hair, Black, Babin, & Anderson (2010), nominal data allow the researcher to examine the various categories of demographic information using frequency distribution. Besides, Cohen, Manion, & Morrison (2011) added that nominal data simply denotes categories or termed as categorical data with no order. The categories are mutually exclusive and have no numerical meaning or no intrinsic value (Cohen et al., 2011). In this study, demographic variables of teachers were quantified by individual scores on 4 items.

3.4.2 Principals' E-Leadership Practices

The study of principals' e-leadership practices dimensions was developed by the researcher. By referring to Heck & Hallinger (1999) (purposes, people and structures and social systems leadership categories), Jameson (2013) (e-leadership framework), Leithwood & Jantzi (2006) (school specific model of transformational leadership

practices), Leithwood, Louis, Anderson, & Wahlstrom (2004) (transformational leadership theory) and Politis & Politis (2011) (e-leadership construct) work, researcher developed a 14 items questionnaire to investigate the relationship between principals' e-leadership practices and teachers' attitudes toward using Frog VLE.

E-leadership construct of principals is measured from 3 different dimensions, namely, 'purpose, 'people' and 'structures and social systems'. Every dimension consisted of a different number of items to measure it. Every dimension has 4 to 5 items as observed variables to measure it and the total number of items in the item pool of principal's e-leadership is 14 listed in Section B of the questionnaire. The summary of the breakdown of the principals' e-leadership practices items according to each dimension is as shown in Table 3.3.

Johnson & Christensen (2008) defined numerical rating scale as a scale consisted of a set of numbers and 'anchored' endpoints and researcher normally label the anchor with a written descriptor. In this study, the researcher employed numerical scale with the response of an option ranging from ('0') which is anchored with the words 'never practice at all' to ('10') which is anchored with the words 'most frequent practice'. The advantage of a numerical rating scale for the measurement of variables in this study was noted by (Chua & Chua, 2017a; Cohen et al., 2011; Hair et al., 2010; Zainudin Awang, 2014). They documented that numerical rating scale provides the highest level of measurement precision and permitting nearly any mathematical operation to be performed and enables the researcher to determine proportions easily. Cohen et al. (2011) added that if a researcher wanted to calculate more sophisticated level statistics such as structural equation modeling, then a ratio scale must have a true zero ('0') and equal intervals. Furthermore, all types of statistical measures are applicable to ratio

scales (Stevens, 1946). Thus, many rating scales use an 11-point scale that runs from '0' to '10', with '0' being 'not at all'(or something equivalent to this, depending on the question/item) and '10' being the highest score (e.g. 'completely'). In this study, an 11-point scale that runs from '0' to '10', with '0' represents 'never practices' at all by the principal whereas '10' represent 'most frequent' practice by the principal on the statement.

Table 3.3: Summary of the Breakdown of the Principals' E-Leadership Practices Items and Dimensions

Dimension	Items	No of items
Purpose	B1-B5	5
People	B6-B10	5
Structures and social systems	B11- B14	4
Total		14

3.4.3 Teachers' Attitude toward using Frog VLE

To study teachers' attitude toward using Frog VLE, researcher adapt the questionnaire dealing with teachers' attitudes towards ICT in education from Albirini (2006) that published in the paper entitle "Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers". Teachers' attitude toward using Frog VLE will be measured according to teachers self-rated based on the three components of teachers' attitude items, namely, affective, cognitive and behavioural. Researcher adapted 15 items from the 'Teachers' attitudes toward ICT in education' questionnaire to suit the context of this study and the 15 items were specially designed to assess attitudes towards the use of Frog VLE for educational purposes.

Each of the three components has different number of items to measure it. Each of the three components has 4 to 6 items as observed variables to measure it as listed in Section C of the questionnaire. All items were rated on the numerical rating scale,

ranging from '0' which is anchored with the words 'not agree at all' to '10' which is anchored with the words 'highest agreement'. The summary of the breakdown of the teachers' attitudes toward using Frog VLE items according to each dimension is as shown in Table 3.4.

Table 3.4: Summary of the Breakdown of the Teachers' Attitude toward using Frog VLE Items and Components

Dimension	Items	No of items
Affective	C1-C5	5
Cognitive	C6-C11	6
Behavioural	C12-C15	4
Total		15

In addition, "Teacher Attitudes towards ICT Scale" developed by Albirini (2006) adopted by both Al-Zaidiyeen, Leong, & Fong (2010) and Zhou, Hu, & Gao (2010). Both studies revised Albirini's (2006) "Teacher Attitudes towards ICT Scale" to suit the context of their study and combining with the domestic education situation.

3.4.4 Teachers' Computer-mediated Communication (CMC) Competence

Teachers' Computer-mediated communication (CMC) competence will be measured according to teachers' self-rated based on CMC Competence measure (version 5) that adapted from Professor Brian H. Spitzberg that published in the paper entitle "Preliminary Development of a Model and Measure of Computer-Mediated Communication (CMC) Competence " in the year 2006. In this study, the researcher looked at three different dimensions of CMC competence measure which are (i) motivation; (ii) knowledge; and (iii) skills.

Each of the three dimensions has different number of items to measure it. The total number of items in Section D of the questionnaire for teachers' CMC competence was 13. Each of the three dimensions has 4 to 5 items as observed variables to measure it. All items were rated on the numerical rating scale, ranging from '0' which is anchored with the words 'not agree at all' to '10' which is anchored with the words 'highest agreement'. The summary of the breakdown of the Teachers' CMC competence items according to each dimension is as shown in Table 3.5.

Table 3.5: Summary of the Breakdown of the Teachers' Computer-mediated Communication (CMC) Competence Items and Dimensions

Dimension	Items	No of items
Motivation	D1-D5	5
Knowledge	D6-D9	4
Skills	D10-D13	4
Total		13

3.4.5 School Virtual Learning Culture

By referring to Albirini's (2006) study, the researcher developed a 8 items questionnaire to investigate the mediating effect of school virtual learning culture on principals' e-leadership practices on the dimensions of teachers' attitude toward using Frog VLE. The 8 items looked at two different dimensions which are (i) values and (ii) beliefs. The items were specially designed to assess school virtual learning culture of 34 daily public secondary schools in Klang district, Selangor, Malaysia.

Each of the two dimensions has different number of items to measure it. The total number of items in Section E of the questionnaire for school virtual learning culture was 8. Each of the two dimensions has 3 to 5 items as observed variables to measure it. The summary of the number of school virtual learning culture items is as shown in Table 3.6.

Table 3.6: Summary of the Breakdown of the School Virtual Learning Culture Items and Dimensions

Dimension	Items	No of items
Values	E1-E3	3
Beliefs	E4-E8	5
Total		8

All items were rated on the numerical rating scale, ranging from '0' which is anchored with the words 'not agree at all' to '10' which is anchored with the words 'highest agreement'. Subsequently, Table 3.7 shows the summary of the number of items and measurement scale by variables and sections of the instrument.

Table 3.7: Items and Measurement Scale by Sections of Instrument

Variable	Section / Label	Number of items	Measurement scale
Moderating	A: Demographic characteristics	4	Nominal
Independent	B: Principals' e-leadership	14	Ratio
Dependant	C: Teachers' attitude toward using Frog VLE (Albirini, 2006)	15	Ratio
Mediating	D: Teachers' computer-mediated communication (CMC) competence competence (Spitzberg, 2006)	13	Ratio
	E: School Virtual Learning Culture	8	Ratio
	Total Item	54	

3.5 Reliability and Validity of the Developed Instrument (Pilot Study)

The instrument of this study was developed by the researcher based on the review of related previous literature, especially by referring to Albirini's (2006); Jameson's (2013); and Spitzberg's (2006) work. The researcher was given permission from Prof Albirini and Prof Spitzberg to adapt some of the survey instrument items (Appendix C and D respectively). The instrument consisted of bilingual items both in English and Malay languages. The English items were translated by researcher and checked by three languages experts who were bilingual (Appendix E, F and G).

After the survey instrument was refined, a pilot study was conducted in order to eliminate the ambiguity of individual questions and to test the reliability and validity of the instrument. 34 teachers from one secondary school in Petaling Jaya, Selangor were chosen randomly to do the pilot test. The participants in the pilot study were not a part of the final study. The pilot test is carried out to ensure the clarity of the word of each item to avoid subjects of this study encounter any difficulty in answering the questionnaire. Besides, it served as a trial run to provide useful information on any unexpected problems that might arise in the actual study. Pilot test participants were asked to point out any ambiguous items by underline words and sentences that they find difficult to understand so that those items could be modified for the final survey instrument.

3.5.1 Validity

Content validity refers to what extent can the measurement represent the content aspect measured (Chua, 2012). To test the survey instrument for content validity, a panel of three experts examined the instrument (Appendix J, K and L). Their comments on content validity were used to eliminate, add, and modify elements of the survey instrument. Besides, expert's suggestions were used to revise the items for consistency of terminology and specificity of questions and responses. The survey instrument was then ready for pre-test before pilot study distribution. Table 3.8 shows some examples of the amended items based on the expert's comments.

Table 3.8: Examples of the Amended Items Based on the Expert's Comments

Expert	Item	Initial Item	Amended Item
No1	B12	We can access current schedules and up-to-date information on last minute scheduling changes through Frog VLE.	We can access up-to-date information through Frog VLE.
	E1	Frog VLE will not make any difference in our classrooms, schools, or lives.	Frog VLE will not make any difference in our classrooms.
	E6	People who are skilled in using Frog VLE have better privileges not available to others.	People who use Frog VLE will have better skills in ICT.
No 2	B14	Kami menggunakan komputer atau Frog VLE untuk menghadiri mesyuarat dalam masa nyata tanpa perlu bersekemuka.	Kami menggunakan Frog VLE untuk menghadiri mesyuarat dalam masa sebenar tanpa perlu bersekemuka.
	D3	Saya berharap untuk duduk di depan komputer saya untuk menulis kepada orang lain melalui Frog VLE.	Saya lebih berminat untuk duduk di depan komputer saya untuk menulis kepada orang lain melalui Frog VLE.
	D4	Saya suka mempunyai pilihan dalam memperbaiki mesej saya dan menjadikan ia lebih berkesan melalui Frog VLE.	Saya suka mempunyai pilihan dalam menghantar mesej Frog VLE saya supaya ia lebih berkesan.
	E4	Mempunyai pengetahuan tentang Frog VLE akan memperolehi kehormatan dari orang lain.	Mempunyai pengetahuan tentang Frog VLE akan memperolehi penghormatan dari orang lain.
No3	B13	We use Frog VLE and ICT tools in meetings.	We use Frog VLE in meetings.
	B14	We use computer or Frog VLE to attend presentations in real time without having to meet face to face.	We use Frog VLE to attend presentations in real time without having to meet face to face.
	C6	Frog VLE saves time and effort.	Frog VLE saves effort
	C10	Frog VLE is a fast and efficient means of getting information.	Frog VLE is an efficient means of getting information.

In order to ensure the accuracy and avoiding any ambiguities of the instrument, the questionnaires were send to 10 bilingual teachers for pre-testing (Leong, 2017). According to Fraenkel et al. (2012), poorly worded questions and unclear questions can be identified through pre-testing of the questionnaire. Besides, unclear instructions of the questionnaires can be revealed as well. Hence, questionnaire of this study was revised according to the respondents' suggestions after pre-test.

In this study, the validation of instrument carried out through an extensive review of the literature on the concept of e-leadership, CMC competence, school virtual learning culture and teachers' attitude toward using the ICT tools; professional review for content analysis; and pre-testing to check for face validity. After receiving comments and feedback from the professional reviewers and pre-testing respondents, unsatisfactory items were revised. Subsequently, the survey was administered to a pilot group to establish the instrument reliability which will be discussed in the section below.

3.5.2 Reliability

The term reliability, as used in research, refers to the capability of all the items in the research instrument to consistently measure the concept (Chua, 2012). The reliability coefficient is an index that indicates the degree of consistency. The internal-consistency method of estimating reliability involves finding the correlation value, the Cronbach's Alpha value, between the score of every item and the total score for all the items in the test or the index score of the test. Thus, in this method, items having a high correlation value with the index score of the test will have high reliability whereas items with a low correlation value will have low reliability and will be removed from the test.

As stated above, to test the instrument for internal-consistency, the survey instrument was assessed using Cronbach's Alpha analysis using data from the pilot study. The test determined reliability by estimating internal-consistency. The data was analyzed using Statistical Package for the Social Sciences (SPSS) software (version 21.0) to calculate the Cronbach's Alpha coefficient.

The polarity of the negative questions in the survey instrument was reversed to analyze it for Cronbach's Alpha. This reversed polarity was used for subsequent

analyses. According to Chua (2012), Cronbach's Alpha coefficient for an instrument in the range of .65 to .95 is sufficient. On the other hand, Johnson& Christensen (2008) and Muijs (2011) indicated that Cronbach's Alpha coefficient greater than .70 is acceptable. The analysis results of the Cronbach's Alpha coefficient of the pilot test (N=34) is as shown in Table 3.9.

Table 3.9: Cronbach's Alpha Coefficient of the Pilot Test (N=34)

Section/ variable	Dimension	No of items	Cronbach's alpha
Section B: Principals' e-leadership	Purpose	5	.800
	People	5	.807
	Structures and social systems	4	.780
Sections C: Teachers' attitude toward using Frog VLE	Affective	5	.805
	Cognitive	6	.883
	Behavioural	4	.760
Sections D: Teachers' CMC competence	Motivation	5	.802
	Knowledge	4	.884
	Skills	4	.793
Sections E: School Virtual Learning culture	Values	3	.867
	Beliefs	5	.854

Based on Table 3.9, it was identified that the Cronbach's Alpha for principals' e-leadership dimensions was in the range of .780 to .807 and teachers' attitude toward using Frog VLE dimensions were in the range of .760 to .883. Next, teachers' CMC competence dimensions were in the range of .793 to .884. Lastly, school virtual learning culture dimensions show a Cronbach's Alpha of .854 and .867. Based on the reliability test, the researcher concluded that the instrument developed for this study showed a very good level of internal consistency reliability.

3.6 Research Procedure

Firstly, the researcher starts by identify areas of interest for research and followed by the process to select a research topic. Discussion with supervisors and extensive literature reviewing for research gaps helps to select the title of this study. Subsequently, the researcher reviews the relevant literature and followed with the writing of research proposals and building the research instrument for this study. After building the survey instrument, a pre-test followed by pilot study was carried out to eliminate the ambiguity of individual questions and to test the reliability and validity of the instrument. In performing the pre-test and pilot test, the researcher personally sends the survey forms to the teachers and feedback were obtained immediately from the teachers that involved in both the pre-test and pilot test.

As soon as the pilot study was completed and the validity and reliability of the instrument were established, the following step is to get faculty's permission and to get approval from the institutional review board according to Creswell (2012). After the research proposal for this study was approved by both of the supervisors and readers from Institute of Educational Leadership, University of Malaya. Researcher proceeds to send an application to ask for permission to carry out the research to Educational Planning and Research Division (EPRD) of the Ministry of Education.

After obtaining permission from EPRD, another letter was sent to the State of Education Department of Selangor acquire further permission to carry out the survey in all secondary schools in Klang district, Selangor. Then, the researcher sends a copy of permission letter and a formal letter to obtain permission from the school's principals to study their setting to all the schools that involved in this study. The researcher then

contacts the principals of the respective schools to make an appointment to conduct the study.

The data collection for the actual study was carried out through direct administration and self-collection method. The researcher will meet up with respective school principal or administrator to get permission to have the staffs list on the appointment date. Next, respondents will be selected using simple random sampling method. Selected respondents will be informed regarding the instrument distribution location and briefed on the purpose of this study. Respondents were informed that their participation was voluntary and confidentiality was assured to alleviate teacher anonymity concerns. Respondents were told to ask the researcher if they have any questions regarding the questionnaire.

Subsequently, respondents were given 20 minutes to fill-in their respond on the provided questionnaires. Upon completion, the researcher collected the survey instrument directly from the respondents. The same procedure was repeated until all the 454 questionnaires from 34 schools in Klang district, Selangor was disseminated, filled and collected. Data collection period starts on August 2016 and ends on November 2016. After data collection, collected data are computerized into Statistical Package for the Social Sciences (SPSS) software (version 21.0) for analysis and interpretation of findings (Chapter 4). The final step is to report and discuss the findings obtained (Chapter 5) and followed by conclusion and recommendations for future studies (Chapter 6). Figure 3.4 shows the research process flowchart of this study.

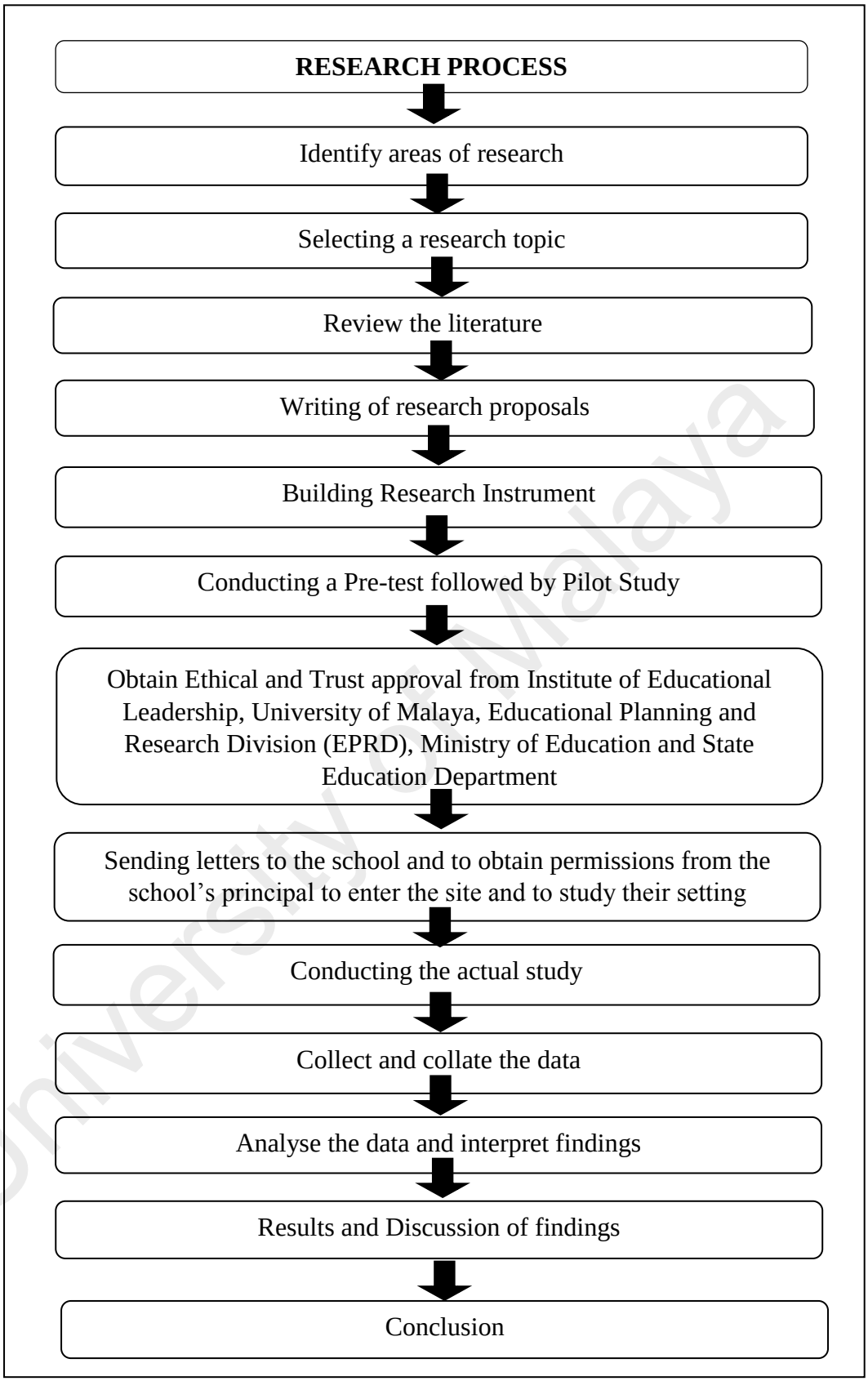

Figure 3.4: Research Process Flowchart

3.7 Analysis of Data

Data collected from 34 schools in Klang district, Selangor will be analyzed quantitatively using the SPSS version 21 software and Smart PLS 2. Both descriptive and inferential statistics were used to analyze the data. This study sought to examine the correlation among principals' e-leadership practices (independent variable), teachers' CMC competencies and school virtual learning culture (mediating variable), teachers' attitude toward using the Frog VLE (dependent variable), and teachers' demographic characteristics (moderating variable). Generally, three different statistical analysis procedures would be carried out to answer each of the research questions. The first four research questions to be answered by descriptive statistics in term of mean and standard deviation. Research question five to research question nine is to be answered by the inferential statistic in term of Spearman's Rho correlation tests which help to identify the relationship between variables (Refer to Section 3.7.2). Lastly, structural equation modeling (SEM) procedures with Smart PLS 2 were carried out to answer research questions tenth to twelfth.

3.7.1 Descriptive Statistic

Descriptive statistics are used to make a conclusion about a variable based on numerical data; used to describe the characteristics of a variable; and descriptive statistics do not use to generalize the research findings of a research sample to the research population (Chua, 2013). Descriptive statistics includes frequencies, means, modes, medians, range, standard deviations, cross-tabulations and standardized scores (Cohen, 2011). In this study, the first four research questions to be answered by descriptive statistics in term of mean and standard deviation.

According to Hair et al. (2010), summated scale is a common procedure to measure abstract constructs and a summated scale consisted of multiple items that are designed to measure the same construct. Multiple items designed to measure a single construct are used to increase the reliability and validity of the measure (Johnson & Christensen, 2014). On the other hand, multiple dimensions are joined in a composite measure to represent a construct to avoid the use of only a single dimension to represent a construct in order to obtain a more "well-rounded" perspective (Hair et al, 2010). Further supported by Hair, Hult, Ringle, & Sarstedt (2016) indicated that the measurement model of multiple items is more accurate based on the assumption that by having several indicators to measure a single concept is more likely to represent all the different aspects of the concept and the objectives is to reduce the measurement error as much as possible. In this study, the summated scale is reported in term of mean and standard deviation for each of the dimensions of principals' e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE.

In addition, the composite mean obtained from the summated scale was used to assess the level of principals' e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE. Table 3.10 shows the interpretation for level according to mean which are divided into low, medium, and high with an equal interval.

Table 3.10: Interpretation for Level According to Mean (Shafinaz, 2016, p. 179; Leong, 2017, p. 228)

Mean	Interpretations (Level)
0.00 – 3.33	Low
3.34 – 6.67	Medium
6.68 – 10.00	High

3.7.2 Spearman's Rho (Inferential Statistic)

Inferential statistic was used to address research questions five to nine. Chua (2013) stated that Spearman's Rho correlation test is used to identify the relationship between variables when the distribution of the data is not normal. The distribution of the data in this study is not normal (Refer to Section 4.3.4). Thus, Spearman's rho correlation coefficient was computed to examine the relationship between variables in this study (RQ5: Is there any relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?; RQ6: Is there any relationship between principals e-leadership with teacher CMC competence toward using the Frog VLE in Klang district secondary schools?; RQ7: Is there any relationship between teacher CMC competence with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?; RQ8: Is there any relationship between principals e-leadership with school virtual learning culture in Klang district secondary schools?; RQ9: Is there any relationship between school virtual learning culture with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?).

The correlation coefficient (*r*) is a measure of the direction and strength of the relationship between the two variables (Chua, 2013). Chua's (2013) table of the strengths of correlation coefficient values is presented in Table 3.11 and the value *r* is in the range of +1.00 to -1.00.

Table 3.11: The Strengths of Correlation Coefficient Values (Chua, 2013, p. 258)

Correlation Coefficient (r)	Strength of Correlation
.91 to 1.00 or -.91 to -1.00	Very Strong
.71 to .90 or -.71 to -.90	Strong
.51 to .70 or -.51 to -.70	Average/ Moderate
.31 to .50 or -.31 to -.50	Weak
.01 to .30 or -.01 to -.30	Very Weak
.00	No Correlation

3.7.3 Structural Equation Modelling (SEM) [Inferential Statistics]

According to Hair et al. (2016), PLS-SEM is primarily used to develop theories in exploratory research through focusing on explaining the variance in the dependent variables when examining the model. A PLS path model consists of two elements. First, there is a structural model better known as an inner model in PLS-SEM that represents the constructs and the measurement model known as an outer model in PLS-SEM of the constructs that display the relationship between the constructs and the indicator variables (Hair et al., 2016).

Ruiz, Gremler, Washburn, & Carrion (2010) indicated that there are four advantages of using PLS-SEM. First, it does not suffer from indeterminacy problems like other causal modeling techniques using LISREL. Second, it is a nonparametric technique which does not assume normality of the data. Third, it does not require as large a sample size as other causal modeling techniques. Lastly, it can be used to estimate models that use both formative and reflective indicators.

According to Ruiz et al. (2010), results are presented in two stages in PLS-SEM. First, an assessment of the reliability and validity of the measurement model are presented. Second, assessment of the structural model which tests the amount of variance explained and the significance of the relationships are presented. In this study, the measurement model in PLS-SEM is assessed in terms of the loadings of the items, average variance extracted (AVE) for each variable, inter-correlations among the variables, Cronbach's alphas, and composite reliabilities.

Further supported by Chua & Chua (2017) stated that validity and reliability of the constructs (variables) in the model using PLS-SEM analysis should be established prior

to further data analysis. Hence, in this study, the convergent validity and discriminant validity for all variables in the model are examined first and followed by examined the composite reliability and Cronbach's alpha internal consistency reliability of the variables.

When the loading of the items for each variable is greater than .50 and the average variance extracted (AVE) for the variable is greater than .50, the convergent validity is achieved (Hair et al., 2016). When the inter-correlations among the variables in the model is smaller than .90, discriminant validity is achieved (Bryne, 2010; Chua & Chua, 2017). Besides, in order to achieve reliability, both the values of composite reliability and Cronbach's alpha should be greater than .70 (Hair et al., 2016). The output of the validity and reliability analysis for the variables principal e-leadership practices, teacher CMC competence, school virtual learning culture, and teacher attitude toward using Frog VLE are discussed in details in Chapter 4.

In this study, the assessment of the mediation and moderation model using PLS-SEM involves the use of bootstrapping. Bootstrapping is a non-parametric resampling procedure that involves repeatedly sampling from the data set and estimating the indirect effect in each resampled data set (Preacher & Hayes, 2008). It does not require the distribution of data to be normal. According to Preacher & Hayes (2008), the more the bootstrap samples the better and they recommend at least 5,000 resamples for final reporting. Hence, based on Preacher & Hayes (2008) recommendation, the number of bootstrap resamples is 5,000 in this study.

PLS-SEM generates t-statistics for significance testing, when the t-statistics are above ±1.96 is considered as significant at 5% of the probability level ($p<.05$) (Chua &

Chua, 2017). According to Wong (2016), there will be no mediating effect in a model if the significance of direct effect cannot be established. Hence, the significance of the direct effect is established first, then the mediator is included in the model and the significance of mediating effect and associated t-statistics are then presented. The strength of the mediator can be examined through the use of total effect by using the formulae total effect equal to direct effect plus mediating effect through standardized regression weight (β) values (Wong, 2016). The mediating effect is the product of a and b based on the mediation model of Baron & Kenny (1986) (Refer to Figure 1.1). Table 3.12 shows the interpretation of the effect size based on Muijs's (2011) table of beta value and strength of effect size.

Table 3.12: The Muijs's Beta Value and Strength of Effect Size (Muijs, 2011, p. 111)

Beta (β)	Strength of Effect Size
> .50	Strong Effect
.30 to .50	Moderate Effect
.10 to .30	Modest Effect
0 to .10	Weak Effect

Similarly, in this study, the significance of the direct and moderating effect are checked using bootstrapping. Both the direct and moderating effect is measured through t-statistics and t-statistics which are above ±1.96 is considered as significant at 5% of the probability level ($p<.05$) (Chua & Chua, 2017). The moderating effect is measured through t-statistics between interaction effect of the moderator and the independent variables on the dependent variables. If the interaction effect is significant, it signified that the moderating variable demonstrated difference effect on the tested causal path. It is thus could be concluded that the moderating effect exists and those variable could be confirmed as a moderator.

Research questions number ten to twelve are answers by the structural equation modeling (SEM) procedure with PLS-SEM (RQ10: Is there any mediating effect of teacher's CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?; RQ11: Is there any mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?; RQ12: Is there any moderating effect of teacher's demographic characteristics on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?). The types of statistical analysis for this study based on the twelve research questions are as shown in Table 3.13.

Table 3.13: Statistical Analysis based on Research Questions

No	Research Question	Variables	Measurement Scale	Type of Analysis
1.	What is the level of teachers' attitude toward using the Frog VLE in Klang district secondary schools?	DV: Teachers' attitude	Ratio	Descriptive statistic: Mean score & standard deviation
2.	What is the level of e-leadership of school principal toward using the Frog VLE in Klang district secondary schools?	IV: Principals' e-leadership	Ratio	Descriptive statistic: Mean score & standard deviation
3.	What is the level of computer-mediated communication (CMC) competence of teachers toward using the Frog VLE in Klang district secondary schools?	MeV: Teachers' CMC	Ratio	Descriptive statistic: Mean score & standard deviation
4.	What is the level of school virtual learning culture toward using the Frog VLE in Klang district secondary schools in Klang district secondary schools?	MeV: SVLC	Ratio	Descriptive statistic: Mean score & standard deviation
5.	Is there any relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?	IV: Principals' e-leadership DV: Teachers' attitude	Ratio Ratio	Inferential statistic: Spearman's Rho correlation
6.	Is there any relationship between principals e-leadership with teacher CMC competence toward using the Frog VLE in Klang district secondary schools?	IV: Principals' e-leadership MeV: Teachers' CMC	Ratio Ratio	Inferential statistic: Spearman's Rho correlation
7.	Is there any relationship between teacher CMC competence with teacher attitudes toward using the Frog VLE in Klang district secondary schools?	MeV: Teachers' CMC DV: Teachers' attitude	Ratio Ratio	Inferential statistic: Spearman's Rho correlation
8.	Is there any relationship between principal e-leadership practices with school virtual learning culture in Klang district secondary schools?	IV: Principals' e-leadership MeV: SVLC	Ratio Ratio	Inferential statistic: Spearman's Rho correlation

Table 3.13 Continued

No	Research Question	Variables	Measurement Scale	Type of Analysis
9.	Is there any relationship between school virtual learning culture with teacher attitudes toward using the Frog VLE in Klang district secondary schools?	MeV: SVLC DV: Teachers' attitude	Ratio Ratio	Inferential statistic: Spearman's Rho correlation
10.	Is there any mediating effect of teacher's CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?	MeV: Teachers' CMC IV: Principals' e-leadership DV: Teachers' attitude	Ratio Ratio Ratio	Inferential statistic: SEM with PLS
11.	Is there any mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?	MeV: SVLC IV: Principals' e-leadership DV: Teachers' attitude	Ratio Ratio Ratio	Inferential statistic: SEM with PLS
12.	Is there any moderating effect of teacher's demographic characteristics on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?	MoV: Demographic IV: Principals' e-leadership DV: Teachers' attitude	Nominal Ratio Ratio	Inferential statistic: SEM with PLS

Note: DV: Dependant Variable; IV: Independent variable; MoV: Moderating Variable; MeV: Mediating Variable; SVLC: School Virtual learning culture; CMC: Computer-mediated communication

3.8 Summary

This chapter provided an overview of methodology to the study. The methodology section starts with a discussion on the research design of the study. Subsequently, the population of this study and sampling procedures was discussed in detail. The subject in

this study consists of all teachers from 34 daily public secondary schools in Klang district, Selangor, Malaysia. Teachers were selected through a simple random sampling procedure by referring to Krejcie and Morgan's sample size determination table. Next, this chapter discusses the procedures for the development of an instrument to examine the relationship between principals' e-leadership practices, teachers' CMC competencies, school virtual learning culture, teachers' attitude toward using the Frog VLE and teachers' demographic characteristics. It also discusses the pre-test, the pilot study and the procedure for data collection. Findings and feedback from experts as well as from the pre-test and pilot study respondents were obtained to further improve the instrument. Finally, analysis of data is discussed in detail and types of statistical analysis for this study based on the twelve research questions are summarized in Table 3.13. Results of the study will be presented in the following Chapter 4 and discussion on the findings obtained will be presented in Chapter 5.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the results of the data analysis and findings of the study. Firstly, this chapter starts with descriptions of the data preparation prior to the analysis, followed by preliminary data analysis in terms of the response rate and an overview of the subjects' demographic characteristics (gender, age group, computer experiences and teaching experiences). Next, normality test for the data distribution is presented and followed by validity and reliability of the model presented using Smart PLS. Finally, statistical analyses for each of the main research questions of this study are presented. The results are presented in the form of descriptive statistics and inferential statistics for each of the research questions proposed based on the data collected from Klang district secondary school.

4.2 Data Preparation Prior to Analysis

There are a few data preparation procedures prior to the preliminary data analysis conducted in this study in order to eliminate errors made by respondents and to validate the completeness and accuracy of the basic data screening step (Cohen et al., 2011). Firstly, the data collected was screened through and those respondents who completed at least 75% of the questionnaire are included and excluded those with more than 25% unanswered questions from the data set for further data analysis (Sekaran, 2003).

Subsequently, data entry procedure was carried out by manually keyed in the raw data into the SPSS Data Editor. The survey data such as the responses to the demographic variables, itemizing the question numbers, variable names, labels and value labels were coded accordingly. Human errors might occur during the data entry

procedure and thus based on Sekaran's (2003) suggestion, 10 % of the coded questionnaires is double checked using systematic sampling procedure. Every tenth record of the respondent's list was checked and if there are too many errors in the selected questionnaires then the researcher will continue to check for all the items. Additionally, outliers of the data collected were examined through SPSS by checking the minimum and maximum values, means and standard deviations of each of the survey items until all values were deemed reasonable.

Next, SPSS missing values analysis procedure was performed to estimate the missing values and to detect the patterns within these missing data. As stated by Tabachnick & Fidell (2012), missing data with less than 5% of the total data and if it is missing in a random pattern from a large data set yielded similar results regardless of how the missing data is being handled. Hence, in this study, cases with more than 5% of obvious errors were removed from the data set for further analysis. Besides, the polarity of the negative questions in the survey instrument was reversed for further analysis.

4.3 Preliminary Data Analysis

Survey response rate, respondents' demographic characteristics, normality test for the data collected through SEM, and construct validity and reliability are reported in the following subsection.

4.3.1 Survey Response Rate

A total of 454 questionnaires were distributed to the respondents and a total of 383 subjects responded to the study. The data collected from 34 schools yield a response rate of 84.4%. According to Krejcie & Morgan (1970), based on the total number of teachers (3931 teachers) in the target population of this study, the minimum number of

respondents needed for this study at 95% confidence level is 351 teachers. Hence, only 351 questionnaires collected were randomly selected using select cases program in SPSS for analysis.

4.3.2 Respondents' Demographic Characteristics

Respondents' demographic characteristics were described by 351 valid responses. The demographic characteristics of respondents in this study comprised of gender, age group, computer experiences and teaching experiences. All these variables were measured as nominal data and descriptive statistics using frequency and percentage are reported. The demographic characteristics of the subjects in this study are presented in Table 4.1.

Table 4.1: Profiles of Respondents according to Demographic Characteristics (N=351)

Variable	Frequency	Percentage (%)
Gender		
Male	60	17.1
Female	291	82.9
Age (At January 2016)		
Below 31 years old	71	20.2
31-40 years old	138	39.3
41-50 years old	97	27.6
51 years old and above	45	12.8
Experiences with computer		
Less than 5 years	18	5.1
5-10 years	72	20.5
More than 10 years	261	74.4
Teaching experiences		
Less than 5 years	48	13.7
5-10 years	114	32.5
More than 10 years	189	53.8

As illustrate in Table 4.1, the total number of female respondents (82.9%; n= 291) is much higher than male respondents (17.1%, n=60). The distribution of respondents by age group indicated that most of the respondents were in the age range of 31-40 years old (39.3%; n=138); followed by those in between 41-50 years old (27.6%, n=97); subsequently those below 31 years old (20.2%, n=71), and lastly those 51 years old and above (12.8%, n=45).

Besides, majority of the respondents have more than ten years of experiences with computer (74.4%; n=261). However, there are 72 teachers out of 351 respondents (20.5%) have five to ten years of experiences in using computer and only 5.1% (n=18) of the respondents have less than five years of experiences in using computer.

In terms of teaching experiences, 189 out of 351 respondents (53.8%) have more than ten years of teaching experiences. A total of 32.5% of respondents (n=114) have five to ten years of experiences in teaching profession and 13.7% of the respondents (n=48) have been teaching for less than five years.

4.3.3 Normality Test for the Data Distribution

Multivariate normality test for each of the dimensions in measuring each of the main variables (principal e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE) of the study is conducted through SEM and is reported in Table 4.2.

Table 4.2: Value of the Multivariate Critical Ratio for Each Variable

Variable	Univariate Normality		Multivariare c.r.
	Skewness	Kurtosis	
E-leadership	.023	-.355	53.595
Purpose	-.610	.110	24.978
People	.053	-.828	38.214
Structure and Social System	.177	-.626	22.182
Attitude	-.220	.116	64.625
Affective	-.012	.324	17.236
Cognitive	-.390	.602	38.271
Behavioural	-.010	-.252	12.893
CMC competence	-.071	-.306	67.508
Motivation	-.127	-.272	36.384
Knowledge	.000	-.297	34.620
Skills	-.129	-.567	27.691
School Virtual Learning Culture	-.318	.951	36.386
Values	-.080	.258	32.500
Beliefs	-.430	.065	22.187

Table 4.2 indicated that the data for the variables principals' e-leadership practices, teachers' attitude toward using Frog VLE, teachers' CMC competence and school virtual learning culture are normally distributed for univariate normality (skewness and kurtosis values) which is in the range of -1.96 to +1.96 (Chua, 2013). However, the data are not normally distributed for multivariate normality. Hence, the data can be presented descriptively using the mean score (univariate normality achieved) but the data cannot be analyzed using parametric tests.

As illustrated in Table 4.2, the value of the multivariate critical ratio for each variable and each dimension was above 8.00 which are in the range of 12.893 to 67.508. In order to achieve multivariate normality, all the items in a proposed model that involved in an analysis need to achieve the benchmark for multivariate normality where the value of the multivariate critical ratio need to be less than 8.00 (Chua & Chua, 2017a). Hence, all the items as proposed in the model of this study do not achieve the

benchmark for multivariate normality. According to Chua & Chua (2017b), PLS-SEM is a non-parametric model testing analysis where the data of the items collected for the analysis does not need to be normally distributed. Thus, the non-parametric tests are used.

4.3.4 Validity and Reliability of the Constructs

According to Chua & Chua (2017b), validity and reliability of the constructs (variables) in the model using PLS-SEM analysis should be established prior to further data analysis. Validity refers to the truthfulness of a measure whether or not it measure what it intends to measure and reliability refers to the consistency of the measurement. Construct validity represents the extent to which a measure assesses the theoretical construct it is designed to assess and it is determined by assessing the convergent validity and discriminant validity. Validity and reliability of the variables in the model using PLS-SEM analysis are divided into two stages. Firstly, the convergent validity and discriminant validity for all variables in the model should be examined and followed by examined the composite reliability and Cronbach's alpha internal consistency reliability of the variables. Validity and reliability of variables in the model should be established in order to ensure that all the items are validly and reliably represented the concepts of all the variables in the model. Next, the relationship between the variables is identified and reported in the results section.

In order to achieve convergent validity, the loadings of the items for each variable should be greater than .50 and the average variance extracted (AVE) for the variable should be greater than .50 (Hair et al., 2016). Discriminant validity can be identified by assessing the inter-correlations among the variables in a reflective model (Garson, 2016). According to Chua & Chua (2017b), in order to achieve discriminant validity of a

construct, the inter-correlations among the variables in the model should be smaller than .90. With the value of inter-correlations among the variables in the model smaller than .90 indicated that there is no overlapping of concept and the variables do not have a significant multi-collinearity problem. If the model has multi-collinearity problem it means that the model has very strong inter-correlation coefficients ($r \geq .90$) between each of the variable (Bryne, 2010).

Besides, in order to achieve reliability, both the values of composite reliability and Cronbach's alpha should be greater than .70 (Hair et al., 2016). The output of the validity and reliability analysis for the variables principal e-leadership practices, teacher CMC competence, school virtual learning culture, and teacher attitude toward using Frog VLE are discussed in details in the section below.

4.3.4.1 Validity and Reliability of Teacher Attitude toward Using Frog VLE through PLS-SEM

Teacher attitude toward using Frog VLE is a latent construct measured by three dimensions which are (i) affective; (ii) cognitive; and (iii) behavioural. Validity (convergent validity and discriminant validity) and reliability (composite reliability and Cronbach's alpha internal consistency reliability) of teacher attitude toward using Frog VLE using PLS-SEM analysis is presented in the following section.

4.3.4.1.1 Convergent Validity

According to Bryne (2010) and Hair et al. (2016), the acceptance level of factor loading is $\geq .50$. The factor loading for all the items of teacher attitude toward using Frog VLE is assessed and those items with factor loading less than .50 are deleted from

the model. Table 4.3 shows the factor loading for all items for teacher attitude toward using Frog VLE in the model.

Table 4.3: Factor Loading for All Items of Teacher Attitude toward Using Frog VLE

Latent variables	Items	Loading
Affective	C1	0.561
	C2	0.833
	C3	0.590
	C4	0.826
	C5	0.656
Cognitive	C6	0.764
	C7	0.708
	C8	0.468
	C9	0.871
	C10	0.839
	C11	0.868
Behavioural	C12	0.834
	C13	0.863
	C14	0.675
	C15	0.832

As shown in Table 4.3, all items for affective and behavioural dimension of teacher attitude toward using Frog VLE passed the acceptance level with factor loadings between .561 to .863 which is more than .50. However, item C8 for cognitive dimension have factor loading less than .50 which is .468. Hence, item C8 is deleted. Next, convergent validity of teacher attitude toward using Frog VLE was evaluated using Average Variance Extracted (AVE) and Table 4.4 shows the results of AVE of teacher attitude toward using Frog VLE.

Table 4.4: Average Variance Extracted (AVE) of Teacher Attitude toward using Frog VLE

Latent variables	AVE	AVE after Item C3 & C5 deleted
Affective	0.4943	0.6630
Cognitive	0.6813	0.6814
Behavioural	0.6462	0.6429
Attitude	0.4616	0.5039

As illustrated in Table 4.4, the AVE for affective dimension is lower than .50 which is .4943. In addition, the AVE for attitude variable is .4616 which is lower than .50 as well. Therefore, items with low factor loading should be removed from the model. Researcher analyzed the PLS algorithm each time after one item is deleted from the model until the AVE of all the dimensions of teacher attitude toward using Frog VLE deemed acceptable which is larger than .50. Lastly, after item C3 and C5 deleted from the model, the AVE of teacher attitude toward using Frog VLE increased to .5039 which is greater than .50. Hence, convergent validity for teacher attitude toward using Frog VLE is achieved.

4.3.4.1.2 Discriminant validity

The next step in the construct validation process is to check for discriminant validity. Discriminant validity reflects the extent to which the measure is unique and different from one another even though each reflects a portion of that construct. Discriminant validity is evaluated by examining the inter-correlations among the variables in the model. Table 4.5 illustrated the inter-correlations of teacher attitude toward using Frog VLE.

Table 4.5: Inter-correlations of Teacher Attitude toward Using Frog VLE

	Affective	**Attitude**	**Behavioural**	**Cognitive**
Affective	1.0000			
Attitude	0.8901	1.0000		
Behavioural	0.6636	0.8215	1.0000	
Cognitive	0.7271	0.9058	0.5572	1.0000

According to Table 4.5, the inter-correlation coefficients among cognitive dimension and attitude were greater than .90 which is .9058 indicated that there is significant multicollinearity problem among the indicators in measuring teacher attitude toward using Frog VLE. Hence, items with highest factor loadings from cognitive dimension in

attitude construct should be deleted. Based on Table 4.6, after item C7 is deleted from the construct, the inter-correlation coefficients among teacher attitude toward using Frog VLE were less than .90 indicated that all the indicators in measuring teacher attitude toward using Frog VLE do not have significant multicollinearity problem. Thus, the discriminant validity of all the items in measuring teacher attitude toward using Frog VLE is achieved.

Table 4.6: Inter-correlations of Teacher Attitude toward Using Frog VLE After Item C7 is Deleted

	Affective	Attitude	Behavioural	Cognitive
Affective	1.0000			
Attitude	0.8910	1.0000		
Behavioural	0.6609	0.8370	1.0000	
Cognitive	0.7198	0.8922	0.5618	1.0000

4.3.4.1.3 Reliability

After assessing the convergent and discriminant validity of teacher attitude toward using Frog VLE, the final step is to determine the reliability of the construct items. In order to achieve reliability, both the values of composite reliability and Cronbach's alpha should be greater than .70 (Hair et al., 2016). Table 4.7 is the results of reliability (composite reliability and Cronbach's alpha) of teacher attitude toward using Frog VLE.

Table 4.7: Reliability of Teacher Attitude toward Using Frog VLE

Latent variables	Composite reliability	Cronbach's Alpha Reliability
Affective	0.8517	0.7364
Cognitive	0.9186	0.8812
Behavioural	0.8780	0.8141
Attitude	0.9203	0.9034

Table 4.7 shows that all the items for teacher attitude toward using Frog VLE yielded composite reliability between .8517 to .9203 and Cronbach's alpha between .7364 to .9034. Thus, both values of composite reliability and Cronbach's alpha internal

consistency reliability are greater than .70, the reliability of teacher attitude toward using Frog VLE is achieved.

4.3.4.2 Validity and Reliability of Principal E-Leadership Practices toward using Frog VLE through PLS-SEM

Principal e-leadership practices toward using Frog VLE is a latent construct measured by three dimensions which are (i) purpose; (ii) people; and (iii) structure and social system. Validity (convergent validity and discriminant validity) and reliability (composite reliability and Cronbach's alpha internal consistency reliability) of principal e-leadership practices toward using Frog VLE using PLS-SEM analysis is presented in the following subsection.

4.3.4.2.1 Convergent Validity

The validity is achieved when all the collapsed items in a measurement model are statistically significant and with factor loading of .50 or above for an indicator (Bryne, 2010; Hair et al., 2016). The factor loading for all the items of principal e-leadership practices toward using Frog VLE is assessed and those items with factor loading less than .50 are deleted from the model. Table 4.8 shows the factor loading for all items for principal e-leadership practices toward using Frog VLE in the model.

Table 4.8: Factor Loading For All Items of Principal E-Leadership Practices toward Using Frog VLE

Latent variables	Items	Loading
Purpose	B1	0.828
	B2	0.771
	B3	0.852
	B4	0.840
	B5	0.898
People	B6	0.824
	B7	0.906
	B8	0.888
	B9	0.848
	B10	0.656
Structure and Social System	B11	0.694
	B12	0.762
	B13	0.844
	B14	0.815

As shown in Table 4.8, all items for purpose, people and structure and social system dimension of principal e-leadership practices toward using Frog VLE passed the acceptance level with factor loadings between .656 to .906 which is more than .50. Additionally, the convergent validity could also be verified by computing the Average Variance Extracted (AVE) for every construct, where the value of AVE should be .50 or higher to achieve the convergent validity. Table 4.9 shows the results of AVE of principal e-leadership practices toward using Frog VLE.

Table 4.9: Average Variance Extracted (AVE) of Principal E-Leadership Practices toward Using Frog VLE

Latent variables	AVE
Purpose	0.7034
People	0.6875
Structure and Social System	0.6098
E-Leadership	0.5072

Based on Table 4.9, the AVE for all the three dimensions, namely, purpose, people, and structure and social system dimension in principal e-leadership practices construct are greater than .50. The AVE for purpose dimension is .7034; the AVE for people

dimension is .6875, and the AVE for structure and social system dimension is .6098. Hence, convergent validity for principal e-leadership practices toward using Frog VLE is achieved.

4.3.4.2.2 Discriminant validity

Next, the discriminant validity is assessed through the correlation between the two collapsed items under the same construct and if the correlation coefficient is less than .90 then indicated that collapsed items do not have significant multicollinearity problem (Hair et al., 2010). The results of inter-correlations of principal e-leadership practices toward using Frog VLE are presented in Table 4.10.

Table 4.10: Inter-correlations of Principal E-Leadership Practices toward Using Frog VLE

	People	Purpose	Structure and Social System	E-Leadership
People	1.0000			
Purpose	0.5800	1.0000		
Structure and Social System	0.8292	0.5308	1.0000	
E-Leadership	0.9271	0.8092	0.8844	1.0000

According to Table 4.10 the inter-correlation coefficients among e-leadership and people dimension were greater than .90 which is .9271 indicated that there is significant multicollinearity problem among the indicators in measuring principal e-leadership practices toward using Frog VLE. Hence, items with highest factor loadings from people dimension in e-leadership construct should be deleted. Based on Table 4.11, after item B10 is deleted from the construct, the inter-correlation coefficients among principal e-leadership practices toward using Frog VLE were less than .90. It shows that all the indicators in measuring principal e-leadership practices toward using Frog VLE do not have significant multicollinearity problem. Thus, the discriminant validity of all

the items in measuring principal e-leadership practices toward using Frog VLE is achieved.

Table 4.11: Inter-correlations of Principal E-Leadership Practices toward Using Frog VLE After Item B10 is Deleted

	People	Purpose	Structure and Social System	E-Leadership
People	1.0000			
Purpose	0.4886	1.0000		
Structure and Social System	0.8086	0.5215	1.0000	
E-Leadership	0.8977	0.7846	0.8929	1.0000

4.3.4.2.3 Reliability

After assessing the convergent and discriminant validity of principal e-leadership practices toward using Frog VLE, the final step is to determine the reliability of the construct items. Reliability of the construct is achieved when both the values of composite reliability and Cronbach's alpha should be greater than .70 (Hair et al., 2016). Table 4.12 is the results of reliability (composite reliability and Cronbach's alpha) of principal e-leadership practices toward using Frog VLE.

Table 4.12: Reliability of Principal E-Leadership Practices toward Using Frog VLE

Latent variables	Composite reliability	Cronbach's Alpha Reliability
Purpose	0.9220	0.8946
People	0.9357	0.9074
Structure and Social System	0.8620	0.7840
E-Leadership	0.9297	0.9175

Table 4.12 shows that all the items for principal e-leadership practices toward using Frog VLE yielded composite reliability between .8620 to .9357 and Cronbach's alpha between .7840 to .9175. Thus, both values of composite reliability and Cronbach's

alpha internal consistency reliability are greater than .70, the reliability of principal e-leadership practices toward using Frog VLE is achieved.

4.3.4.3 Validity and Reliability Teacher CMC Competence toward Using Frog VLE through PLS-SEM

Teacher CMC Competence is a latent construct measured by three dimensions which are (i) motivation; (ii) knowledge; and (iii) skills. Validity (convergent validity and discriminant validity) and reliability (composite reliability and Cronbach's alpha internal consistency reliability) of teacher CMC Competence toward using Frog VLE using PLS-SEM analysis is presented in the section below.

4.3.4.3.1 Convergent Validity

According to Bryne (2010) and Hair et al. (2016), the acceptance level of factor loading is ≥ .50. The factor loading for all the items of teacher CMC Competence toward using Frog VLE is assessed and those items with factor loading less than .50 are deleted from the model. Table 4.13 shows the factor loading for all items for of teacher CMC Competence toward using Frog VLE in the model.

Table 4.13: Factor Loading for All Items of Teacher CMC Competence toward Using Frog VLE

Latent variables	Items	Loading
Motivation	D1	0.882
	D2	0.866
	D3	0.857
	D4	0.786
	D5	0.266
Knowledge	D6	0.901
	D7	0.889
	D8	0.930
	D9	0.883
Skills	D10	0.735
	D11	0.812
	D12	0.889
	D13	0.886

As shown in Table 4.13, all items for knowledge and skills dimension of teacher CMC competence toward using Frog VLE passed the acceptance level which is more than .50 with factor loadings between .883 to .930 and between .735 to .889 respectively. However, for dimension motivation there is one item with factor loading lower than .50 which is item D5, therefore, item D5 is deleted from the construct. Next, convergent validity of teacher CMC competence toward using Frog VLE was evaluated using Average Variance Extracted (AVE) and Table 4.14 shows the results of AVE of teacher CMC competence toward using Frog VLE.

Table 4.14: Average Variance Extracted (AVE) of Teacher CMC Competence toward Using Frog VLE

Latent variables	AVE	AVE after Item D9 deleted
Knowledge	0.7260	0.7260
Motivation	0.8113	0.8503
Skills	0.6752	0.6752
CMC Competence	0.5950	0.5851

As illustrated in Table 4.14, the AVE of teacher CMC competence toward using Frog VLE for the three dimensions which are knowledge, motivation, and skills are in the range of .5950 to .8113. It shows that the AVE for teacher CMC competence construct is greater than .50. However, in the section below it shows that teacher CMC competence does not achieve discriminant validity (Refer to Table 4.15) and item D9 need to be deleted. AVE for motivation dimension is .8503; AVE for knowledge dimension is .7260, and AVE for skills dimension is .6752 after item D9 is deleted. AVE for teacher CMC competence is .5851 which is greater than .50 shows that the convergent validity of this construct is achieved.

4.3.4.3.2 Discriminant validity

Subsequently, discriminant validity for the construct teacher CMC competence is assessed in the section below. It is evaluated by examining the inter-correlations among the variables in the model. Table 4.15 presented the results of inter-correlations of teacher CMC competence toward using Frog VLE.

Table 4.15: Inter-correlations of Teacher CMC Competence toward Using Frog VLE

	CMC Competence	**Knowledge**	**Motivation**	**Skill**
CMC Competence	1.0000			
Knowledge	0.9152	1.0000		
Motivation	0.8944	0.7131	1.0000	
Skill	0.9434	0.832	0.7731	1.0000

According to Table 4.15, the inter-correlation coefficients among knowledge dimension and CMC competence were greater than .90 which is .9152. Besides, inter-correlation coefficients among skills dimension and CMC competence were greater than .90 as well which is .9434. Thus, it shows that there is significant multicollinearity problem among the indicators in measuring teacher CMC competence toward using Frog VLE. Hence, items need to be deleted. Based on Table 4.16, after item D9 is deleted from the construct, the inter-correlation coefficients among teacher CMC competence toward using Frog VLE were less than .90. It shows that all the indicators in measuring teacher CMC competence toward using Frog VLE do not have significant multicollinearity problem. Thus, the discriminant validity of all the items in measuring teacher CMC competence toward using Frog VLE is achieved.

Table 4.16: Inter-correlations of Teacher CMC Competence toward Using Frog VLE After Item D9 Deleted

	CMC Competence	Knowledge	Motivation	Skills
CMC Competence	1.0000			
Knowledge	0.8738	1.0000		
Motivation	0.8936	0.6608	1.0000	
Skills	0.8979	0.693	0.6996	1.0000

4.3.4.3.3 Reliability

After assessing the convergent and discriminant validity of teacher CMC competence toward using Frog VLE, the final step is to determine the reliability of the construct items. The reliability of a construct is achieved when the composite reliability and Cronbach's alpha are greater than .70 (Hair et al., 2016). The results of reliability (composite reliability and Cronbach's alpha) and AVE of teacher CMC competence toward using Frog VLE after item D9 deleted are presented in Table 4.17.

Table 4.17: Reliability of Teacher CMC Competence toward Using Frog VLE

Latent variables	Composite reliability	Cronbach's Alpha Reliability
Motivation	0.9136	0.8733
Knowledge	0.9446	0.9121
Skills	0.8925	0.8391
CMC Competence	0.9392	0.9284

Table 4.17 shows that all the items for teacher CMC competence toward using Frog VLE yielded composite reliability between .8925 to 0.9446 and Cronbach's alpha between .8391 to .9284. Thus, both values of composite reliability and Cronbach's alpha internal consistency reliability are greater than .70, the reliability of teacher CMC competence toward using Frog VLE is achieved.

4.3.4.4 Validity and Reliability School Virtual Learning Culture through PLS-SEM

School virtual learning culture is a latent construct measured by two dimensions which are (i) values and (ii) beliefs. The validity (convergent validity and discriminant validity) and reliability (composite reliability and Cronbach's alpha internal consistency reliability) of school virtual learning culture using PLS-SEM analysis is presented in the section below.

4.3.4.4.1 Convergent Validity

According to Bryne (2010) and Hair et al. (2016), the acceptance level of factor loading is ≥ .50. The factor loading for all the items of school virtual learning culture construct is assessed and those items with factor loading less than .50 are deleted from the model. Table 4.18 shows the factor loading for all items for school virtual learning culture in the model.

Table 4.18: Factor Loading For All Items of School Virtual Learning Culture

Latent variables	Items	Loading
Values	E1	0.948
	E2	0.947
	E3	0.684
Beliefs	E4	0.752
	E5	0.831
	E6	0.838
	E7	0.842
	E8	0.800

As shown in Table 4.18, all items for values and beliefs dimension of school virtual learning culture construct passed the acceptance level with factor loadings between .684 to .948 which is more than .50. Next, convergent validity of teacher attitude toward using Frog VLE was evaluated using Average Variance Extracted (AVE) and Table 4.19 shows the results of AVE of school virtual learning culture.

Table 4.19: Average Variance Extracted (AVE) of School Virtual Learning Culture

Latent variables	AVE	AVE after item E4 deleted
Values	0.7546	0.7547
Beliefs	0.6612	0.7040
School Virtual Learning Culture	0.4874	0.5054

Table 4.19 shows that the AVE for school virtual learning culture is lower than .50 which is .4874. Therefore, items should be removed from the model in order to achieve convergent validity. After item E4 is deleted from the model, the AVE of school virtual learning culture increased to .5054 which is greater than .50. Hence, convergent validity for school virtual learning culture construct is achieved.

4.3.4.4.2 Discriminant validity

The next step in the construct validation process is to check for discriminant validity. It is evaluated by examining the inter-correlations among the variables in the model. Table 4.20 presented the results of inter-correlations of school virtual learning culture.

Table 4.20: Inter-correlations of School Virtual Learning Culture

	Beliefs	School Virtual Learning Culture	Values
Beliefs	1.0000		
School Virtual Learning Culture	0.878	1.0000	
Values	0.3845	0.7795	1.0000

As illustrated in Table 4.20, the inter-correlation coefficients among school virtual learning culture were less than .90 indicated that all the indicators in measuring school virtual learning culture do not have significant multicollinearity problem. Thus, the discriminant validity of all the items in measuring school virtual learning culture is achieved.

4.3.4.4.3 Reliability

After assessing the convergent and discriminant validity of school virtual learning culture, the final step is to determine the reliability of the construct items. The reliability of a construct is achieved when the composite reliability and Cronbach's alpha are greater than .70 (Hair et al., 2016). Table 4.21 is the results of reliability (composite reliability and Cronbach's alpha) of school virtual learning culture.

Table 4.21: Reliability of School Virtual Learning Culture

Latent variables	Composite reliability	Cronbach's Alpha Reliability
Values	0.9004	0.8306
Beliefs	0.9048	0.8597
School Virtual Learning Culture	0.8753	0.8316

Table 4.21 shows that all the items for school virtual learning culture yielded composite reliability between .8753 to .9048 and Cronbach's alpha between .8306 to .8597. Thus, both values of composite reliability and Cronbach's alpha internal consistency reliability are greater than .70, the reliability of school virtual learning culture is achieved.

As described in the previous section of this chapter, all the four variables in this study, namely, principal e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE have achieved their construct validity (convergent validity and discriminant validity) and reliability. In the following section, the researcher would like to present the results of the present study.

4.4 Results of the Study

The results of this study based on each of the research questions proposed in chapter one would be presented in the section below. Generally, three different statistical

analysis procedures would be carried out to answer each of the research questions. The first four research questions to be answered by descriptive statistics in term of mean and standard deviation. Research question five to research question nine are to be answered by inferential statistic in term of Spearman's-rho tests which help to identify the relationship between variables. Lastly, structural equation modeling (SEM) procedures with Smart PLS 2 were carried out to answer research questions tenth to twelfth.

4.4.1 Research Question 1

What is the level of teachers' attitude toward using the Frog VLE in Klang district secondary schools?

Descriptive statistic was used to analyze the data collected from 351 teachers in Klang district secondary schools. The dependent variable, teacher attitude toward using Frog VLE comprised of three dimensions: (i) Affective; (ii) Cognitive and (iii) Behavioural. First, the means and standard deviations for each of the teacher attitude toward using Frog VLE dimensions as well as the overall mean and standard deviation of teacher attitude toward using Frog VLE would be reported. As has been discussed in section 4.3.3, the data are distributed in terms of univariate normality (skewness and kurtosis schieved). Hence, the data can be descriptively presented using the mean scores. These mean scores would be interpreted into the levels of teacher attitude toward using Frog VLE according to the interpretation shown in Table 3.10. The analysis yield results as shown in Table 4.22.

Table 4.22: Mean, Standard Deviation and the Level of Teacher Attitude toward Using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1) Affective	5.88	2.04	Medium
2) Cognitive	5.72	2.04	Medium
3) Behavioural	5.12	2.16	Medium
Overall	5.57	1.80	Medium

Referring to Table 4.22, the overall mean for teacher attitude toward using Frog VLE is 5.57. This could be interpreted as medium level of teacher attitude toward using Frog VLE in Klang district secondary schools. The results of the analysis for each of the teacher attitude toward using Frog VLE dimensions indicated that all the three dimensions namely, affective (M=5.88, S.D.=2.04); cognitive (M=5.72, S.D.=2.04); and behavioural (M=5.12, S.D.=2.16) showed medium level of mean.

In the following section, means and standard deviations for each of the items based on each of teacher attitude toward using Frog VLE dimensions would be reported. There are 15 items in Section C of the questionnaire to measure teacher attitude toward using Frog VLE. However, after validation and reliability analysis of the variables in the model, only 11 items will be used to measure teacher attitude toward using Frog VLE in this study. Besides, the mean scores of each of the items are compared with the overall mean of each dimension of teacher attitude toward using Frog VLE and reported in the below section. In addition, each of the item's means would be arranged and presented in descending order for better illustration.

4.4.1.1 Dimension 1: Affective

The first dimension, affective comprised of three items. The means and standard deviations for all the three items are arranged in Table 4.23.

Table 4.23: Mean and Standard Deviation for Each of the Items in Affective Dimension (N=351)

Item	Description	Mean	S.D.
C1	Frog VLE does not scare me at all.	7.03	2.34
C4	Using Frog VLE is enjoyable.	5.52	2.53
C2	I am glad there is Frog VLE these days.	5.09	2.66
	Overall Mean	5.88	2.04

The descriptive statistics in Table 4.23 showed that there are only one item which are item C1 (M=7.03, S.D.=2.34) have higher mean than the overall mean of affective dimension (M=5.88, S.D.=2.04). These indicated that the respondents agreed that Frog VLE does not scare them at all. However, item C4 and item C2 have lower mean than the overall mean of affective dimension whereas item C2 (M=5.09, S.D.=2.66) have the lowest mean among all the three items in affective dimension. This meant that the respondents rated lowest level of agreement that they are glad that there is Frog VLE these days in school among all items in affective dimension.

4.4.1.2 Dimension 2: Cognitive

The second dimension, cognitive comprised of four items. The means and standard deviations for all the four items are arranged in Table 4.24.

Table 4.24: Mean and Standard Deviation for Each of the Items in Cognitive Dimension (N=351)

Item	Description	Mean	S.D.
C10	Frog VLE is an efficient means of getting information.	6.20	2.32
C9	Frog VLE would motivate students to study.	5.90	2.37
C11	Frog VLE enhances student's learning.	5.75	2.25
C6	Frog VLE saves effort.	5.02	2.57
	Overall Mean	5.72	2.04

The descriptive statistics in Table 4.24 showed that there are three items have higher mean than the overall mean of cognitive dimension (M=5.72, S.D.=2.04). These items are item C10, item C9, and item C11. Item C10 (M=6.20, S.D.=2.32) have the highest mean score among all the items in cognitive dimension. These indicated that the respondents agreed that Frog VLE is an efficient means of getting information. Nevertheless, item C6 (M=5.02, S.D.=2.57) have lower mean than the overall mean of cognitive dimension and with the lowest mean among all the four items in cognitive

dimension. This meant that the respondents rated lowest level of agreement that Frog VLE saves effort among all items in cognitive dimension.

4.4.1.3 Dimension 3: Behavioural

Behavioural dimension, the third dimension for the variable attitude comprised of four items. The means and standard deviations for all the four items are arranged in Table 4.25.

Table 4.25: Mean and Standard Deviation for Each of the Items in Behavioural Dimension (N=351)

Item	Description	Mean	S.D.
C14	I would like to learn more about Frog VLE.	6.03	2.61
C15	I have no intention to use Frog VLE in the near future.	5.34	2.79
C13	I would avoid using Frog VLE as much as possible.	4.97	2.75
C12	I would rather do things manually than using Frog VLE.	4.16	2.61
	Overall mean	5.12	2.16

The descriptive statistics in Table 4.25 showed that there are two items have higher mean than the overall mean of behavioural dimension (M=5.12, S.D.=2.16). These items are item C14 and item C15. Item C14 (M=6.03, S.D.=2.61) have the highest mean score among all the items in behavioural dimension. This indicated that the respondents agreed that they would like to learn more about Frog VLE. Nevertheless, item C13 and item C12 have lower mean than the overall mean of behavioural dimension whereas item C12 (M=4.16, S.D.=2.61) have the lowest mean among all the four items in behavioural dimension. This meant that the respondents rated lowest level of agreement that they would rather do things manually than using Frog VLE among all items in behavioural dimension.

In conclusion, the results indicated that teachers in Klang district, Selangor secondary schools showed medium level of attitude toward using Frog VLE. All the

three dimensions namely, affective (M=5.88, S.D.=2.04); cognitive (M=5.472, S.D.=2.04); and behavioural (M=5.12, S.D.=2.16) showed medium level of mean.

4.4.2 Research Question 2

What is the level of e-leadership of school principal toward using the Frog VLE in Klang district secondary schools?

The following sections provide descriptive findings from 351 respondents from the 34 schools in Klang district that included in this study. The independent variable, principal e-leadership toward using Frog VLE comprised of three dimensions: (i) Purpose; (ii) People and (iii) Social and Structure System. Initially, the means and standard deviations for each of the principal e-leadership toward using Frog VLE dimensions as well as the overall mean and standard deviation of principal e-leadership practices would be reported. These means would be interpreted into the levels of principal e-leadership practices according to the interpretation shown in Table 3.10. The results of the analysis are as shown in Table 4.26.

Table 4.26: Mean, Standard Deviation and the Level of Principal E-Leadership toward Using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1) Purpose	7.13	1.66	High
2) People	4.09	2.46	Medium
3) Structure and Social System	4.76	1.91	Medium
Overall	5.32	1.73	Medium

As illustrated in Table 4.26, the overall mean of principal e-leadership practices toward using Frog VLE is 5.32. This could be interpreted that majority of the respondents perceived that their principals demonstrated medium level of e-leadership practices in Klang district secondary schools. There is only one dimensions out of three dimensions of principal e-leadership toward using Frog VLE have higher mean than the

overall mean (M=5.32, S.D.=1.73) which are purpose (M=7.13, S.D.=1.66). On the other hand, dimension people (M=4.09, S.D.=2.46) and structure and social system (M=4.76, S.D.=1.91) have lower mean than the overall mean. Purpose dimension have mean that are interpreted as high level, however, both people and structure and social system dimension have mean that are interpreted as medium level and the overall mean indicated that principals in Klang district secondary schools demonstrated medium level of e-leadership practices.

In the following section, means and standard deviations for each of the items based on each of principal e-leadership practices dimensions would be reported. There are 14 items in Section B of the questionnaire to measure principal e-leadership toward using Frog VLE. However, after validation and reliability analysis of the variables in the model, item B10 are removed from the model. Hence, only 13 items will be use to measure principal e-leadership practices toward using Frog VLE in this study. Besides, the mean of each of the items are compared with the overall mean of each dimensions of principal e-leadership practices toward using Frog VLE. Then, the highest and lowest mean of the particular item is reported based on the comparison between mean of each of the items with the overall mean of each dimensions of principal e-leadership practices toward using Frog VLE.

4.4.2.1 Dimension 1: Purpose

The first dimension, purpose comprised of five items. The means and standard deviations for all the five items are arranged in Table 4.27.

Table 4.27: Mean and Standard Deviation for Each of the Items in Purpose Dimension (N=351)

Item	Description	Mean	S.D.
B1	My principal support upon the teachers' use of Frog VLE for teaching and learning.	7.87	2.03
B2	My principal provides attainable goals for all the teachers.	7.69	1.68
B4	My principal keeping student learning at the centre of ICT decision making.	6.92	1.79
B5	My principal provides clear vision of using Frog VLE for teaching and learning.	6.87	2.02
B3	My principal has a continuous dialogue about pedagogic use of Frog VLE with us.	6.28	2.34
	Overall mean	7.13	1.66

The descriptive statistics in Table 4.27 showed that there are two items have higher mean than the overall mean of purpose dimension (M=7.13, S.D.=1.66). These items are item B1 and item B2. Item B1 (M=7.87, S.D.=2.03) have the highest mean score among all the items in purpose dimension. This indicated that the respondents agreed the most that their principal supports them to use Frog VLE for teaching and learning. However, item B4, B5, and B3 have lower mean than the overall mean of purpose dimension. Item B3 (M=6.28, S.D.=2.34) have the lowest mean among all the five items in purpose dimension. This indicated that the respondents rated lowest level of agreement that their principal has a continuous dialogue about the pedagogic use of Frog VLE with them among all items in purpose dimension.

4.4.2.2 Dimension 2: People

The second dimension, people comprised of four items. The means and standard deviations for all the four items are as shown in Table 4.28.

Table 4.28: Mean and Standard Deviation for Each of the Items in People Dimension (N=351)

Item	Description	Mean	S.D.
B6	My principal creates a schedule for responding to messages through Frog VLE.	5.04	2.87
B9	My principal allocates funds to let Frog VLE-capable teachers spend time coaching their colleague.	4.40	2.88
B7	My principal responds at least one times per day to our messages through Frog VLE.	3.47	2.70
B8	My principal is having fixed scheduled messages through Frog VLE with teacher.	3.45	2.67
	Overall mean	4.09	2.46

As illustrated in Table 4.28, item B6 and item B9 have higher mean than the overall mean of people dimension (M=4.09, S.D.=2.46) with item B6 (M=5.04, S.D.=2.87) having the highest mean score among all the items in people dimension followed by item B9 (M=4.40, S.D.=2.88). This is interpreted as the respondents agreed the most that their principal creates a schedule to respond to their messages through Frog VLE. On the other hand, item B7 and B8 have lower mean than the overall mean of people dimension. Item B8 (M=3.45, S.D.=2.67) have the lowest mean among all the four items in people dimension. The respondents rated lowest level of agreement that their principal is having fixed scheduled messages through Frog VLE with teacher among all items in people dimension.

4.4.2.3 Dimension 3: Structure and Social System

The third dimension also the last dimension of the variable principal e-leadership practices toward using Frog VLE known as structure and social system consisted of four items. The means and standard deviations for all the four items are arranged in Table 4.29.

Table 4.29: Mean and Standard Deviation for Each of the Items in Structure and Social System Dimension (N=351)

Item	Description	Mean	S.D.
B11	My principal provides resources to support teachers' professional development.	6.99	1.89
B12	We can access up-to-date information through Frog VLE.	6.20	2.41
B13	We use Frog VLE in meetings.	3.11	2.75
B14	We use Frog VLE to attend presentations in real time without having to meet face to face.	2.73	2.62
	Overall mean	4.76	1.91

Based on Table 4.29, there are two items have higher mean than the overall mean of structure and social system dimension (M=4.76, S.D.=1.91). These items are item B11 and item B12. Item B11 (M=6.99, S.D.=1.89) have the highest mean score among all the items in structure and social system dimension. It shows that the respondents have the highest agreement on the item B11 (My principal provides resources to support teachers' professional development). However, item B13 and B14 have lower mean than the overall mean of structure and social system dimension. Item B14 (M=2.73, S.D.=2.62) have the lowest mean among all the four items in structure and social system dimension which means the respondents have the lowest agreement that they use Frog VLE to attend presentations in real time without having to meet face to face.

In conclusion, the results indicated that teachers perceived that their principals demonstrated medium level of e-leadership practices in Klang district secondary schools. There is only one dimension out of three dimensions of principal e-leadership toward using Frog VLE are at high level which is purpose dimension (M=7.13, S.D.=1.66). On the other hand, dimension people (M=4.09, S.D.=2.46) and structure and social system (M=4.76, S.D.=1.91) showed medium level of e-leadership practices.

4.4.3 Research Question 3

What is the level of computer-mediated communication (CMC) competence of teachers toward using the Frog VLE in Klang district secondary schools?

Teacher CMC competence as the mediator of this study is measured by three dimensions which are (i) Motivation; (ii) Knowledge; and (iii) Skills. Descriptive statistics were used to analyze the data obtained from 351 respondents from 34 secondary schools in Klang district in order to answer this research question. The overall mean and standard deviation of teacher CMC competence together with the means and standard deviations for each of the teacher CMC competence dimensions would be computed using SPSS. Subsequently, these means would be interpreted into the levels of teacher CMC competence based on the interpretation shown in Table 3.10. Table 4.30 shows the results of the analysis.

Table 4.30: Mean, Standard Deviation and the Level of Teachers CMC Competence toward Using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1) Motivation	4.45	2.03	Medium
2) Knowledge	4.08	2.15	Medium
3) Skills	4.10	2.00	Medium
Overall	4.21	1.82	Medium

Table 4.30 showed that the overall mean of teachers CMC competence is 4.21. This could be interpreted as medium level of teachers CMC competence in Klang district secondary schools. There is only one dimension out of three dimensions of teachers CMC competence have higher mean than the overall mean (M=4.21, S.D.=1.82) which is motivation (M=4.45, S.D.=2.03). Meanwhile, both dimensions knowledge (M=4.08, S.D.=2.15) and skills (M=4.10, S.D.=2.00) have lower mean than the overall mean. All three dimensions for teacher CMC competence (motivation, knowledge and skills) have mean that are interpreted as medium level. These meant that the respondents rated

themselves as demonstrating medium level of CMC competence for all the three teacher CMC competence dimensions in Klang district secondary schools.

In the following section, means and standard deviations for each of the items based on each of teacher CMC competence dimensions would be reported. There are 13 items in Section D of the questionnaire to measure teacher CMC competence toward using Frog VLE. However, after validation and reliability analysis of the variables in the model, item D5 and D9 are removed from the model. Hence, only 11 items will be used to measure teacher CMC competence toward using Frog VLE in this study. Besides, the mean of each of the items is compared with the overall mean of each dimension of teacher CMC competence toward using Frog VLE. Then, the highest and lowest mean of the particular item is reported based on the comparison between the mean of each of the items with the overall mean of each dimension of teacher CMC competence toward using Frog VLE.

4.4.3.1 Dimension 1: Motivation

The first dimension of the variable teacher CMC competence, motivation comprised of four items. The means and standard deviations for all the four items are arranged in Table 4.31.

Table 4.31: Mean and Standard Deviation for Each of the Items in Motivation Dimension (N=351)

Item	Description	Mean	S.D.
D4	I like tinkering with options to make my messages through Frog VLE more effective.	5.15	2.31
D1	I enjoy communicating using Frog VLE.	4.60	2.41
D2	Communicating through Frog VLE relieves some of my tension.	4.05	2.36
D3	I look forward to sitting down at my computer to write to others through Frog VLE.	4.01	2.44
	Overall mean	4.45	2.03

As illustrated in Table 4.31, item D4 and item D1 have higher mean than the overall mean of motivation dimension (M=4.45, S.D.=2.03) with item D4 (M=5.15, S.D.=2.31) having the highest mean score among all the items in motivation dimension followed by item D1 (M=4.60, S.D.=2.41). This is interpreted as the respondents agreed the most that they like tinkering with options to make their messages through Frog VLE more effective. On the other hand, item D2 and D3 have lower mean than the overall mean of motivation dimension. Item D3 (M=4.01, S.D.=2.44) have the lowest mean among all the four items in motivation dimension. The respondents rated lowest level of agreement that they look forward to sitting down at their computer to write to others through Frog VLE.

4.4.3.2 Dimension 2: Knowledge

The second dimension, knowledge comprised of three items. The means and standard deviations for all the three items are as shown in Table 4.32.

Table 4.32: Mean and Standard Deviation for Each of the Items in Knowledge Dimension (N=351)

Item	Description	Mean	S.D.
D7	I am never at a loss in using Frog VLE to say something.	4.28	2.36
D6	I am very knowledgeable about how to communicate through Frog VLE.	4.11	2.38
D8	I am very familiar with communication through Frog VLE.	3.85	2.24
	Overall mean	4.08	2.15

Based on Table 4.32, two items have higher mean than the overall mean of knowledge dimension (M=4.08, S.D.=2.15) which are item D7 (M=4.28, S.D.=2.36) and item D6 (M=4.11, S.D.=2.38). Item D7 have the highest mean score among all the items in knowledge dimension based on the respond given by the respondents. This indicated that the respondents agreed that they will never at a loss in using Frog VLE to

say something. However, item D8 (M=3.85, S.D.=2.24) have the lowest mean among all the three items in knowledge dimension. This meant that the respondents rated lowest level of agreement that they are very familiar with communication through Frog VLE among all the items in knowledge dimension.

4.4.3.3 Dimension 3: Skills

The last dimension, skills comprised of four items. The means and standard deviations for all the four items are arranged and presented in Table 4.33.

Table 4.33: Mean and Standard Deviation for Each of the Items in Skills Dimension (N=351)

Item	Description	Mean	S.D.
D12	I have no trouble expressing my opinions forcefully on Frog VLE messages.	4.43	2.35
D10	I can show compassion through the way I write messages.	4.25	2.59
D11	I use a lot of the expressive symbols [e.g.,‘‘smile’’] in my Frog VLE messages.	4.07	2.36
D13	When I receive a message from someone, I reply within 24 hours.	3.64	2.45
	Overall mean	4.10	2.00

According to Table 4.33, there are two item have higher mean than the overall mean of skills dimension (M=4.10, S.D.=2.00). These items are item D12 (M=4.43, S.D.=2.35) and item D10 (M=4.25, S.D.=2.59). This indicated that respondents agreed that they have no trouble expressing their opinions forcefully on Frog VLE messages. Item D13 (M=3.64, S.D.=2.45) have the lowest mean among all the four items in skills dimension. The respondents rated lowest level of agreement that when they receive a message from someone, they reply within 24 hours.

In conclusion, results indicated that teachers in Klang district, Selangor secondary schools showed medium level of CMC competence toward using Frog VLE. All three

dimensions for teacher CMC competence (motivation, knowledge, and skills) have mean that are interpreted as medium level. The highest mean among the three dimensions of CMC competence was motivation (M=4.45, S.D.=2.03), followed by skills (M=4.10, S.D.=2.00), and lastly knowledge (M=4.08, S.D.=2.15) dimension.

4.4.4 Research Question 4

What is the level of school virtual learning culture toward using the Frog VLE in Klang district secondary schools in Klang district secondary schools?

The second mediator, school virtual learning culture is measured by two dimensions which are (i) Values; and (ii) Beliefs. In order to answer this research question, descriptive statistics were used to analyze the data obtained from 351 respondents from 34 secondary schools in Klang district. The overall mean and standard deviation of school virtual learning culture together with the means and standard deviations for each of the school virtual learning culture dimensions would be computed using SPSS and the means would be interpreted into the levels of school virtual learning culture based on the interpretation shown in Table 3.10. The analysis yield results as shown in Table 4.34.

Table 4.34: Mean, Standard Deviation and the Level of School Virtual Learning Culture toward Using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1. Values	5.14	2.10	Medium
2. Beliefs	5.93	2.02	Medium
Overall	5.53	1.71	Medium

Table 4.34 showed that the overall mean of school virtual learning culture is 5.53. This could be interpreted as medium level of school virtual learning culture in Klang district secondary schools. Beliefs dimension (M=5.93, S.D.=2.02) of school virtual

learning culture have higher mean than the overall mean (M=5.53, S.D.=1.71). Meanwhile, values dimension (M=5.14, S.D.=2.10) have lower mean than the overall mean. Both values and beliefs dimensions have mean that are interpreted as medium level. These meant that the respondents in Klang district secondary schools perceived that their school demonstrating medium level of school virtual learning culture.

In the following section, means and standard deviations for each of the items based on each of school virtual learning culture dimensions would be reported. There are 8 items in Section E of the questionnaire to measure school virtual learning culture. However, after validation and reliability analysis of the variables in the model, item E4 are removed from the model. Hence, only 7 items will be use to measure school virtual learning culture in this study. Besides, the mean of each of the items are compared with the overall mean of each dimension of school virtual learning culture. Then, the highest and lowest mean of the particular item is reported based on the comparison between mean of each of the items with the overall mean of each dimension of school virtual learning culture.

4.4.4.1 Values

The first dimension, values comprised of three items. Table 4.35 shows the means and standard deviations for all the three items and the values are arranged in descending order.

Table 4.35: Mean and Standard Deviation for Each of the Items in Values Dimension (N=351)

Item	Description	Mean	S.D.
E2	Frog VLE will not make any difference in our schools.	5.63	2.45
E1	Frog VLE will not make any difference in our classrooms.	5.51	2.49
E3	Students prefer learning from teachers than to learn from Frog VLE.	4.29	2.33
	Overall mean	5.14	2.10

As illustrated in Table 4.35, item E2 and item E1 have higher mean than the overall mean of values dimension (M=5.14, S.D.=2.10) with item E2 (M=5.63, S.D.=2.45) having the highest mean score among all the items in values dimension followed by item E1 (M=5.51, S.D.=2.49). This is interpreted as the respondents agreed the most that Frog VLE will not make any difference in their schools. Item E3 (M=4.29, S.D.=2.33) have the lowest mean among all the three items in values dimension. The respondents rated lowest level of agreement that students prefer learning from teachers than to learn from Frog VLE.

4.4.4.2 Beliefs

The second dimension also the last dimension of the variable school virtual learning culture known as beliefs consisted of four items. The means and standard deviations for all the four items are arranged in descending order and are presented in Table 4.36.

Table 4.36: Mean and Standard Deviation for Each of the Items in Beliefs Dimension (N=351)

Item	Description	Mean	S.D.
E6	People who use Frog VLE will have better skills in ICT.	6.36	2.34
E7	The increased proliferation of Frog VLE will make our work easier.	6.18	2.32
E5	Students need to know how to use Frog VLE for their future jobs.	6.00	2.35
E8	Frog VLE should be a priority in education.	5.16	2.61
	Overall mean	5.93	2.02

Based on Table 4.36, item E6, item E7 and item E5 have higher mean than the overall mean of beliefs dimension (M=5.93, S.D.=2.02) with item E6 (M=6.36, S.D.=2.34) having the highest mean score among all the items in beliefs dimension followed by item E7 (M=6.18, S.D.=2.32) and item E5 (M=6.00, S.D.=2.35). This is interpreted as the respondents agreed the most that people who use Frog VLE will have better skills in ICT. However, item E8 (M=5.16, S.D.=2.61) have the lowest mean

among all the four items in beliefs dimension. These indicated that the respondents rated lowest level of agreement that Frog VLE should be a priority in education.

In conclusion, results indicated that teachers in Klang district, Selangor secondary schools perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE. Both values and beliefs dimensions have mean that are interpreted as medium level. The highest mean among the two dimensions of school virtual learning culture was beliefs dimension (M=5.93, S.D.=2.02) and followed by values (M=5.14, S.D.=2.10) dimension.

4.4.5 Research Question 5

Is there any relationship between principals e-leadership with teacher attitudes toward using the Frog VLE in Klang district secondary schools?

The Spearman's rho correlation test which is one of the inferential statistics was performed to examine the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. The researcher would compute the mean for principal e-leadership practices and the mean for teacher attitude toward using Frog VLE before the analysis using SPSS. Subsequently, the correlation analysis was performed by comparing the means of these two variables. The results of the analysis are presented in Table 4.37.

Table 4.37: Spearman's rho Correlation Analysis between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Variable		Teacher Attitude toward using Frog VLE
Principal E-Leadership Practices	Spearman's rho Correlation	.411**
	Sig. (2-tailed)	.000

** Correlation is significant at the 0.01 level (2-tailed)

As illustrated in Table 4.37, there is statistically significant positive correlation (r=.411, p<.01) between principal e-leadership practices (M=5.32, S.D.=1.73) and teacher attitude toward using Frog VLE (M=5.57, S.D.=1.80). Correlation coefficient of r=.411 indicated that the correlation strength between principal e-leadership practices and teacher attitude toward using Frog VLE is weak. Subsequently, inter-correlation analysis between each of the principal e-leadership practices dimensions and teacher attitude dimensions toward using Frog VLE are presented in Table 4.38.

Table 4.38: Inter-Correlation Analysis between Each of the Principal E-Leadership Practices Dimensions and Teacher Attitude Dimensions toward Using Frog VLE (N=351)

Principal E-Leadership Practices Dimension	Teacher Attitude toward using Frog VLE Dimension			
	Spearman's rho Correlation R			Significant
	Affective	Cognitive	Behavioural	
Purpose	.360**	.330**	.190**	.000
People	.303**	.320**	.206**	.000
Structure and Social System	.372**	.405**	.263**	.000

** Correlation is significant at the 0.01 level (2-tailed)

According to Table 4.38, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with all the three dimensions of teacher attitude toward using Frog VLE at significant level of p<.01. Affective dimension and cognitive dimension of teacher attitude toward using Frog VLE demonstrated weak but statistically significant correlation with all the three principal e-leadership practices dimensions, namely, purpose, people and structure and social system. The r of affective dimension with purpose, people and structure and social system are .360, .303, and .372 respectively, with *p*-values for all the dimensions equal to .000. Besides, the r of cognitive dimension with purpose, people and structure and social system are .330, .320, and .405 respectively, with *p*-values for all the dimensions

equal to .000. On the other hand, behavioural dimension with purpose (r= .190, p=.000), people (r= .206, p=.000) and structure and social system (r= .263, p=.000) showed very weak but statistically significant correlation at the significant level of p<.01.

In conclusion, based on the results in Table 4.38, it can be concluded that there is statistically significant weak and positive correlation between principal e-leadership practices and teacher attitude toward using Frog VLE. In addition, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with the three teacher attitude toward using Frog VLE dimensions.

4.4.6 Research Question 6

Is there any relationship between principal e-leadership with teacher CMC competence toward using the Frog VLE in Klang district secondary schools?

Inferential statistic was used to address this research question and Spearman's rho correlation test was performed to examine the relationship between principal e-leadership practices and teacher CMC competence toward using Frog VLE. The mean for principal e-leadership practices and the mean for teacher CMC competence toward using Frog VLE was compute using SPSS prior to the analysis. Next, the correlation analysis was performed by comparing the means of these two variables. The analysis yield results are presented in Table 4.39.

Table 4.39: Spearman's rho Correlation Analysis between Principal E-Leadership Practices and Teacher CMC competence toward Using Frog VLE

Variable		Teacher CMC competence toward using Frog VLE
Principal E-Leadership Practices	Spearman's rho Correlation	.499**
	Sig. (2-tailed)	.000

** Correlation is significant at the 0.01 level (2-tailed)

Based on Table 4.39, there is statistically significant positive correlation (r=.499, p<.01) between principal e-leadership practices (M=5.32, S.D.=1.73) and teacher CMC competence toward using Frog VLE (M=4.21, S.D.=1.82). Correlation coefficient of r=.499 indicated that the correlation strength between principal e-leadership practices and teacher CMC competence toward using Frog VLE is weak. After that, researcher would analyze the relationship between each of the mean principal e-leadership practices dimensions with the mean of teacher a CMC competence dimensions toward using Frog VLE. The analysis yield results are presented in Table 4.40.

Table 4.40: Inter-Correlation Analysis between Each of the Principal E-Leadership Practices Dimensions and Teacher CMC Competence Dimensions toward Using Frog VLE (N=351)

Principal E-Leadership Practices Dimension	Teacher CMC competence toward using Frog VLE			
	Spearman's rho Correlation R			Significant
	Motivation	Knowledge	Skills	
Purpose	.315**	.234**	.206**	.000
People	.456**	.384**	.381**	.000
Structure and Social System	.518**	.446**	.470**	.000

** Correlation is significant at the 0.01 level (2-tailed)

By referring to Table 4.40, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with all the three dimensions of teacher CMC competence toward using Frog VLE at significant level of p<.01. Motivation dimension showed weak positively correlation with purpose and people dimension but showed moderately strong positive correlation with structure and social system dimension of principal e-leadership practices toward using Frog VLE. The correlation coefficient of motivation dimension with each of the principal e-leadership dimensions are arranged in the descending order as followed: Structure and Social System (r= .518, p= .000); People (r= .456, p= .000); and Purpose (r= .315, p= .000).

On the one hand, knowledge dimension showed weak positively correlation with people and structure and social system dimension but showed very weak positive correlation with purpose dimension of principal e-leadership practices toward using Frog VLE. The correlation coefficient of knowledge dimension with each of the principal e-leadership dimensions are arranged in the descending order as followed: Structure and social system (r= .446, p= .000); People (r= .384, p= .000); and Purpose (r= .234, p= .000).

On the other hand, skills dimension showed weak positively correlation with people and structure and social system dimension but showed very weak positively correlation with purpose dimension of principal e-leadership practices toward using Frog VLE. The correlation coefficient of skills dimension with each of the principal e-leadership dimensions are arranged in the descending order as followed: Structure and social system (r= .470, p= .000); People (r= .381, p= .000); and Purpose (r= .206, p= .000).

In conclusion, the results showed that there is statistically significant weak but positive correlation between principal e-leadership practices and teacher CMC competence toward using Frog VLE. In addition, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with all the three teacher CMC competence toward using Frog VLE dimensions.

4.4.7 Research Question 7

Is there any relationship between teacher CMC Competence with teacher attitudes toward using the Frog VLE in Klang district secondary schools?

The Spearman's rho correlation test was performed to examine the relationship between teacher CMC competence and teacher attitude toward using Frog VLE. The

researcher would compute the mean for teacher CMC competence and the mean for teacher attitude toward using Frog VLE before the analysis using SPSS. Subsequently, the correlation analysis was performed by comparing the means of these two variables. The results of the analysis are presented in Table 4.41.

Table 4.41: Spearman's rho Correlation Analysis between Teacher CMC Competence and Teacher Attitude toward Using Frog VLE

Variable		Teacher Attitude toward using Frog VLE
Teacher CMC competence	Spearman's rho Correlation	.694**
	Sig. (2-tailed)	.000

** Correlation is significant at the 0.01 level (2-tailed)

As illustrated in Table 4.41, there is a statistically significant positive correlation (r=.694, p<.01) between teacher CMC competence (M=4.21, S.D.=1.82) and teacher attitude toward using Frog VLE (M=5.57, S.D.=1.80). Based on correlation coefficient, of r=.694, the correlation strength between teacher CMC competence and teacher attitude toward using Frog VLE is interpreted as moderate strong (Refer to Table 3.11). Next, the researcher would analyze the relationship between each of the mean teacher CMC competence dimensions with the mean of teacher attitude dimensions toward using Frog VLE. Table 4.42 shows the results of the analysis.

Table 4.42: Inter-Correlation Analysis between Each of the Teacher CMC Competence Dimensions and Teacher Attitude toward using Frog VLE (N=351)

Teacher CMC competence	Teacher Attitude toward using Frog VLE			
	Spearman's rho Correlation R			Significant
	Affective	Cognitive	Behavioural	
Motivation	.662**	.703**	.501**	.000
Knowledge	.580**	.475**	.492**	.000
Skills	.510**	.535**	.365**	.000

** Correlation is significant at the 0.01 level (2-tailed)

Based on Table 4.42, all the three teacher CMC competence dimensions were statistically significant and positively correlated with all the three dimensions of teacher attitude toward using Frog VLE at a significant level of p<.01. Affective dimension showed moderately strong positively correlation with all the three dimensions, namely, motivation, knowledge, and skills of teacher CMC competence toward using Frog VLE. The correlation coefficient of affective dimension with each of the teacher CMC competence dimensions are arranged in the descending order as followed: Motivation (r= .662, p= .000); Knowledge (r= .580, p= .000); and Skills (r= .510, p= .000).On the one hand, cognitive dimension showed moderate strong positively correlation with motivation and skills dimension but showed weak positive correlation with knowledge dimension of teacher CMC competence toward using Frog VLE. The correlation coefficient of cognitive dimension with each of the teacher CMC competence toward using Frog VLE dimensions are arranged in the descending order as followed: Motivation (r= .703, p= .000); Skills (r= .535, p= .000); and Knowledge (r= .475, p= .000). On the other hand, behavioural dimension showed weak positive correlation with the three dimensions of teacher CMC competence toward using Frog VLE. The correlation coefficient of behavioural dimension with each of the teacher CMC competence dimensions are arranged in the descending order as followed: Motivation (r= .501, p= .000); Knowledge (r= .492, p= .000); and Skills (r= .365, p= .000).

In conclusion, based on the results in Table 4.42, it can be concluded that there is statistically significant moderate strong positive correlation between teacher CMC competence and teacher attitude toward using Frog VLE. In addition, all the three teacher CMC competence dimensions were statistically significant and positively correlated with the three teacher attitude toward using Frog VLE dimensions.

4.4.8 Research Question 8

Is there any relationship between principal e-leadership practices with school virtual learning culture in Klang district secondary schools?

Inferential statistic was used to address this research question. The Spearman's rho correlation test was performed to examine the relationship between principal e-leadership practices and school virtual learning culture. The researcher would compute the mean for principal e-leadership practices and the mean for school virtual learning culture before the analysis using SPSS. Subsequently, the correlation analysis was performed by comparing the means of these two variables. The analysis yield result as shown in Table 4.43.

Table 4.43: Spearman's rho Correlation Analysis between Principal E-Leadership Practices and School Virtual Learning Culture

Variable		School Virtual Learning Culture
Principal E-Leadership Practices	Spearman's rho Correlation	.267**
	Sig. (2-tailed)	.000

** Correlation is significant at the 0.01 level (2-tailed)

By referring to Table 4.43, there is a statistically significant positive correlation ($r=.267$, $p<.01$) between principal e-leadership practices ($M=5.32$, $S.D.=1.73$) and school virtual learning culture ($M=5.53$, $S.D.=1.71$). The correlation coefficient of $r=.267$ indicated that the correlation strength between principal e-leadership practices and school virtual learning culture is very weak. After that, the researcher would analyze the relationship between each of the mean principal e-leadership practices dimensions with the mean of school virtual learning culture. The results of analysis are presented in Table 4.44.

Table 4.44: Inter-Correlation Analysis between Each of the Principal E-Leadership Practices Dimensions and School Virtual Learning Culture (N=351)

Principal E-Leadership Practices	School Virtual Learning Culture			
	Spearman's rho Correlation r	Significant	Spearman's rho Correlation r	Significant
	Values		Beliefs	
Purpose	.081	.130	.334**	.000
People	.072	.180	.237**	.000
Structure and Social System	.111 **	.000	.298**	.000

** Correlation is significant at the 0.01 level (2-tailed)

By referring to Table 4.44, purpose dimension (r=.081, p>.01) and people dimension (r=.072, p>.01) of principal e-leadership practices are not statistically significant with the values dimension of school virtual learning culture. However, they are positively correlated with one another at a significant level of p>.01. On the other hand, structure and social system dimension of principal e-leadership practices showed very weak positive correlation with values dimension of school virtual learning culture (r=.111, p=.000).

As illustrated in Table 4.44, all the three principal e-leadership dimensions, namely, purpose, people, and structure and social system were statistically significant and positively correlated with the beliefs dimension of school virtual learning culture. All the dimensions showed weak positive correlation with the beliefs dimension of school virtual learning culture at a significant level of p<.01. The correlation coefficient of beliefs dimension with each of the principal e-leadership dimensions are arranged in the descending order as followed: Purpose (r= .334, p= .000); Structure and Social System (r= .298, p= .000); and People (r= .237, p= .000).

In conclusion, based on the results in Table 4.44, it can be concluded that there is statistically significant very weak but positive correlation between principal e-leadership practices and school virtual learning culture. In addition, purpose and people dimension of principal e-leadership practices were not statistically significant but positively correlated with values dimension of the school virtual learning culture. Structure and social system dimension of principal e-leadership practices were statistically significant and positively correlated with values dimension of school virtual learning culture. All the three principals' e-leadership practices dimensions were statistically significant and positively correlated with the beliefs dimension of school virtual learning culture.

4.4.9 Research Question 9

Is there any relationship between school virtual learning culture with teacher attitudes toward using the Frog VLE in Klang district secondary schools?

The Spearman's rho correlation test which is one of the inferential statistics was performed to examine the relationship between school virtual learning culture and teacher attitude toward using Frog VLE. The researcher would compute the mean for school virtual learning culture and the mean for teacher attitude toward using Frog VLE before the analysis using SPSS. Subsequently, the correlation analysis was performed by comparing the means of these two variables. The results of the analysis are presented in Table 4.45.

Table 4.45: Spearman's rho Correlation Analysis between School Virtual Learning Culture and Teacher Attitude toward Using Frog VLE

Variable		Teacher Attitude toward using Frog VLE
School Virtual Learning Culture	Spearman's rho Correlation	.722**
	Sig. (2-tailed)	.000

** Correlation is significant at the 0.01 level (2-tailed)

Based on Table 4.45, there is a statistically significant positive correlation (r=.722, p<.01) between school virtual learning culture (M=5.53, S.D.=1.71) and teacher attitude toward using Frog VLE (M=5.57, S.D.=1.80). Based on the correlation coefficient, r=.722, the correlation strength between school virtual learning culture and teacher attitude toward using Frog VLE is interpreted as strong. The results of inter-correlation analysis between each of the mean of school virtual learning culture dimensions with the mean of teacher attitude dimensions toward using Frog VLE are presented in Table 4.46.

Table 4.46: Inter-Correlation Analysis between Each of School Virtual Learning Culture Dimensions and Teacher Attitude toward Using Frog VLE (N=351)

School Virtual Learning Culture Dimension	Teacher Attitude toward using Frog VLE			
	Spearman's rho Correlation R			Significant
	Affective	Cognitive	Behavioural	
Values	.338**	.368**	.534**	.000
Beliefs	.622**	.661**	.515**	.000

** Correlation is significant at the 0.01 level (2-tailed)

According to Table 4.46, all the two school virtual learning culture dimensions were statistically significant and positively correlated with all the three dimensions of teacher attitude toward using Frog VLE at a significant level of p<.01. Affective dimension of teacher attitude toward using Frog VLE demonstrated statistically significant moderate strong positive correlation with beliefs dimension (r=.622, p=.000) but demonstrated statistically significant weak but positive correlation with values dimension (r=.338, p=.000) of school virtual learning culture dimensions.

Similarly, cognitive dimension of teacher attitude toward using Frog VLE demonstrated statistically significant moderate strong positive correlation with beliefs

dimension (r=.661, p=.000) but demonstrated statistically significant weak but positive correlation with values dimension (r=.368, p=.000) of school virtual learning culture dimensions.

On the other hand, the results of inter-correlation analysis between the mean of behavioural dimension and mean of school virtual learning culture dimensions revealed that both the school virtual learning culture dimensions were statistically significant and positively correlated with behavioural dimension. The r of behavioural dimension with values and beliefs dimension are .534 and .515 respectively, with *p*-values for all the dimensions equal to .000.

In conclusion, based on the results in Table 4.46, it can be concluded that there is statistically significant strong and positive correlation between school virtual learning culture and teacher attitude toward using Frog VLE. In addition, all the two school virtual learning culture dimensions were statistically significant and positively correlated with the three teacher attitude toward using Frog VLE dimensions.

4.4.10 Research Question 10

Is there any mediating effect of teachers' CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?

This research question intended to address the effect of teacher CMC competence as a mediating variable in the relationship between principal e-leadership practices (independent variable) and teacher attitude toward using Frog VLE (dependent variable) in a model. Thus, Structural Equation Modeling (SEM) analysis was used to test the mediation model with data collected from Klang district secondary schools.

SEM was utilized to test the direct and mediating relationship between principal e-leadership practices (independent variable), teacher attitude toward using Frog VLE (dependent variable), and teacher CMC competence (mediating variable). PLS-SEM was used to perform the mediation analysis in this study. Mediation analysis of the Preacher and Hayes's (2008) two steps procedure involves the use of bootstrapping. First, a total effect model is presented by showing there is significant total effect of principal e-leadership practices on teacher attitude toward using Frog VLE using bootstrapping. The total effect is measured through t-statistics as PLS-SEM generates t-statistics for significance testing between independent and dependent variables. There will be no mediating effect in a model if the significance of total effect cannot be established (Wong, 2016).

Next, after the significance of the total effect is established, the mediator is included in the model and the significance of direct effect and mediating effect and associated t-statistics are then checked using the path coefficients. The strength of the mediator can be examined through the use of total effect by using the formulae as followed: total effect equal to direct effect plus mediating effect. The total effect of principals' e-leadership and teachers' attitude toward using Frog VLE are presented in the following section.

4.4.10.1 Total Effect of Principals' E-Leadership on Teachers' Attitude toward Using Frog VLE

T-statistics, standardized regression weight, (β) and R^2 of path coefficients of principal e-leadership practices on teacher attitude toward using Frog VLE is as shown in Table 4.47.

Table 4.47: T-statistics, Standardized regression weight (β) and R^2 of Path Coefficients of Principal E-Leadership Practices on Teacher Attitude toward Using Frog VLE

Regression			T-statistics (Bootstrapping value)	Standardized regression weight (β)	R^2
Independent variable		Dependent variable			
E-Leadership	→	Attitude	4.9811***	.4169	.1738

*Significant at p<.05; **Significant at p<.01; ***Significant at p<.001

The output showed in Table 4.47 indicated that principal e-leadership having a significant total effect on teacher attitude toward using Frog VLE with t-statistics greater than 1.96 (β = .4169, t=4.9811, p<.001). By referring to Table 4.47, R^2 for teacher attitude toward using Frog VLE is equal to .1738, it is interpreted as, with the help of principal e-leadership, teacher attitude toward using Frog VLE would be maximized to 17.38%. In other word, only 17.38% of teacher attitude toward using Frog VLE is due to principal e-leadership practices. Figure 4.1 illustrated the total effect model of principal e-leadership practices on teacher attitude toward using Frog VLE.

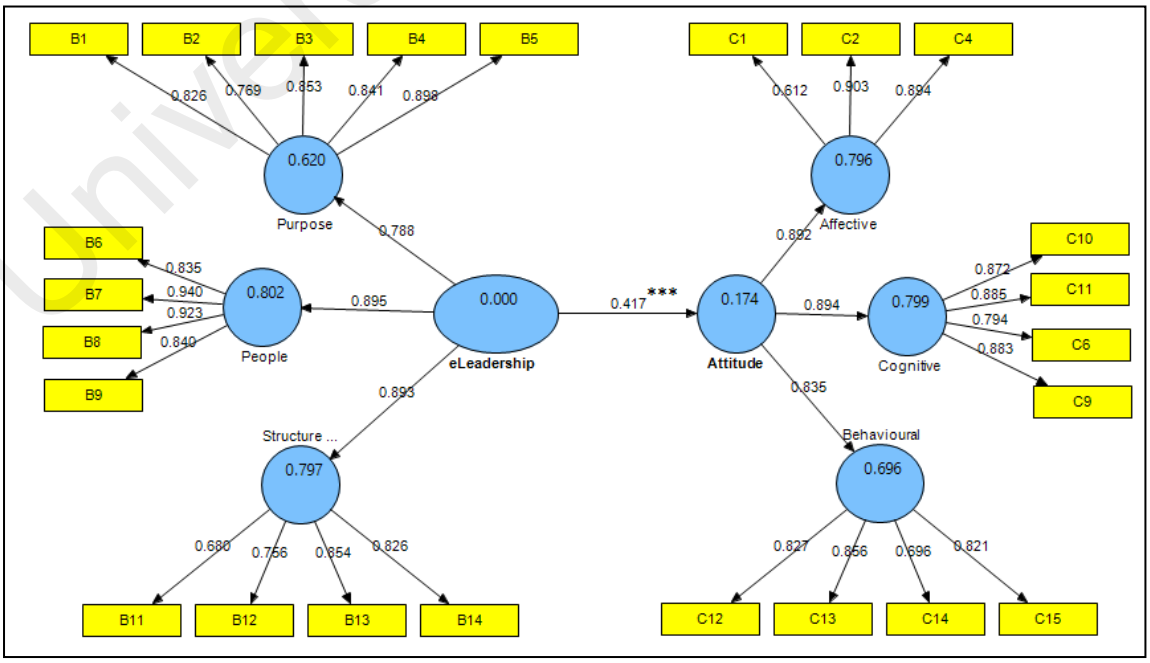

Figure 4.1: The Total Effect Model of Principal E-Leadership Practices on Teacher Attitude toward Using Frog VLE

4.4.10.2 Direct Effect and Mediating Effect of Teachers' CMC Competence on the Relationship between Principals' E-Leadership and Teachers' Attitude toward Using Frog VLE

The mediating variable of this study which is teacher CMC competence is enter into the model and obtained an output as shown in Figure 4.2. In addition, t-statistics, standardized regression weight (β) and R^2 of the relationship between principal e-leadership practices, teacher CMC competence, and teacher attitude toward using Frog VLE are as illustrated in Table 4.48.

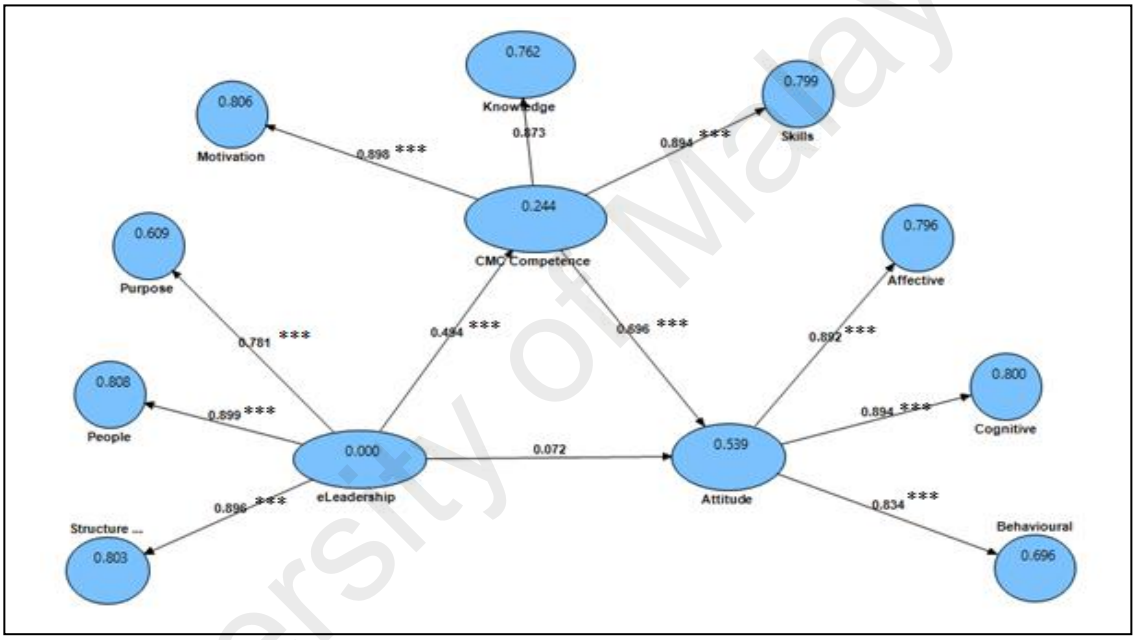

Figure 4.2: Mediation Model for Teacher CMC Competence on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.48: T-statistics, Standardized regression weight (β), and R^2 of the Relationship between Principal E-Leadership Practices, Teacher CMC Competence and Teacher Attitude toward Using Frog VLE

Regression			T-statistics	Result	β	R^2	Effect
Independent variable		Dependent variable					
E-leadership	→	CMC	6.0856***	Significant	.4936	.2436	Mediating =.4936 x .6960 =.3435
CMC	→	Attitude	9.3024***	Significant	.6960	.5387	
E-leadership	→	Attitude	0.8507	Not Significant	.0715	.5387	Direct

Note: CMC= CMC Competence; *Significant at p<.05; **Significant at p<.01; ***Significant at p<.001

By referring to Table 4.48, SEM analysis with Smart PLS shows that t-statistics values for the individual path CMC competence-Attitude (β= .6960, t= 9.3024, p<.001) and e-leadership-CMC competence (β= .4936, t= 6.0856, p<.001) are greater than 1.96 and it is statistically significant. However, the individual path between e-leadership and attitude (β= .0715, t= 0.8507) yield not statistically significant results at the level of p>.05.

Based on Table 4.48, R^2 for teacher attitude toward using Frog VLE is equal to .5387, it is interpreted as, with the help of principal e-leadership and teacher CMC competence, teacher attitude toward using Frog VLE would be maximized to 53.87%. In other word, a total of 53.87% of teacher attitude toward using Frog VLE is due to principal e-leadership practices and teacher CMC competence. On the other hand, only 24.36% of teacher CMC competence is due to principal e-leadership practices.

By referring to Table 4.48, it shows that there is a significant mediating effect of teachers' CMC competence on the relationship between principal e-leadership practices and teachers' attitude toward using Frog VLE. Both principals' e-leadership practices to CMC competence (t=6.0856, p<.001) and CMC competence to teachers attitude (t=9.3024, p<.001) shows statistically significant result. However, there is no significant direct effect of the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE (t=0.8507). It was found that t-statistics is lower than 1.96. When there is no significant causal relationship or direct effect between the causal variable and the outcome variable, it indicated that full mediating effect occurs (Baron & Kenny, 1986). Hence, full mediating effect of teacher CMC competence occurs in the model between principal e-leadership practices and teacher attitude toward using Frog VLE. It means the relationship between principals' e-leadership practices and teachers'

attitudes toward using Frog VLE would only occur with the existing of teacher CMC competence. A positive CMC competence would cause positive effect of principals' e-leadership on teachers' attitude toward using Frog VLE. Hence, it is confirmed that teacher CMC competence established the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE from non-significant to significant from β= .0715 to β = .4150 (Refer to Table 4.48 and Figure 4.3).

On the other hand, the effects of teacher CMC competence on the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE are depicted in Figure 4.3. According to Wong (2016), the total effect is equal to direct effect plus indirect effect (mediating effect). Therefore, the total effects of e-leadership practices on teachers' attitude is equal to .4150 (.0715 + .3435) at significant level of $p<.05$, it showed that principal e-leadership practices and teacher CMC competence have moderate effect on teacher attitude toward using Frog VLE in Klang district secondary schools based on Muijs' table of beta value and strength of effect size (Refer to Table 3.12).

Total effect = direct effect + mediating effect
= .4150 (Significant)

Mediating effect =.4936 x .6960 = .3435 (Significant)

Direct effect = .0715 (Not Significant)

Note: Full mediating effect occurs when there is a significant mediating effect and there is no direct significant effect between principals' e-leadership and teachers' attitude toward using Frog VLE (Baron & Kenny, 1986)

Figure 4.3: Effect of Teacher CMC Competence on Relationship between Principals' E-Leadership and Teachers' Attitude toward Using Frog VLE

In conclusion, based on Table 4.48, it can be concluded that there is a significant and positive full mediating effect of teacher CMC competence on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.4.11 Research Question 11

Is there any mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?

This research question intended to address the effect of school virtual learning culture as a mediating variable in the relationship between principal e-leadership practices (independent variable) and teacher attitude toward using Frog VLE (dependent variable) in a model. PLS-SEM was used to perform the mediation analysis in this study. It was utilized to test the direct and mediating relationship between principal e-leadership practices (independent variable) and teacher attitude toward using Frog VLE (dependent variable); and school virtual learning culture (mediating variable).

First, a total effect model is presented by showing there is significant total effect of principal e-leadership practices on teacher attitude toward using Frog VLE using bootstrapping. The total effect is measured through t-statistics as PLS-SEM generates t-statistics for significance testing between independent and dependent variables. Next, the mediator is included in the model and the significance of direct effect and mediating effect and associated t-statistics are then checked using the path coefficients. The strength of the mediator can be examined through the use of total effect by using the formulae as followed: total effect equal to direct effect plus indirect effect (mediating effect).

4.4.11.1 Total Effect of Principals' E-Leadership on Teachers' Attitude toward Using Frog VLE

As described in the previous section (Section 4.4.10.1) of this chapter, principal e-leadership having a significant total effect on teacher attitude toward using Frog VLE with t-statistics greater than 1.96 (β = .4169, t=4.9811, p<.001) (Refer to Table 4.47 and Figure 4.1).

4.4.11.2 Direct Effect and Mediating Effect of School Virtual Learning Culture on the Relationship between Principals' E-Leadership and Teachers' Attitude toward Using Frog VLE

Once the significance of the total effect between principal e-leadership on teacher attitude toward using Frog VLE is established, the second mediating variable of this study which is school virtual learning culture enters into the model. The mediation model for school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE is as shown in Figure 4.4. In addition, t-statistics, standardized regression weight (β) and R^2 of the relationship between principal e-leadership practices, school virtual learning culture and teacher attitude toward using Frog VLE are presented in Table 4.49.

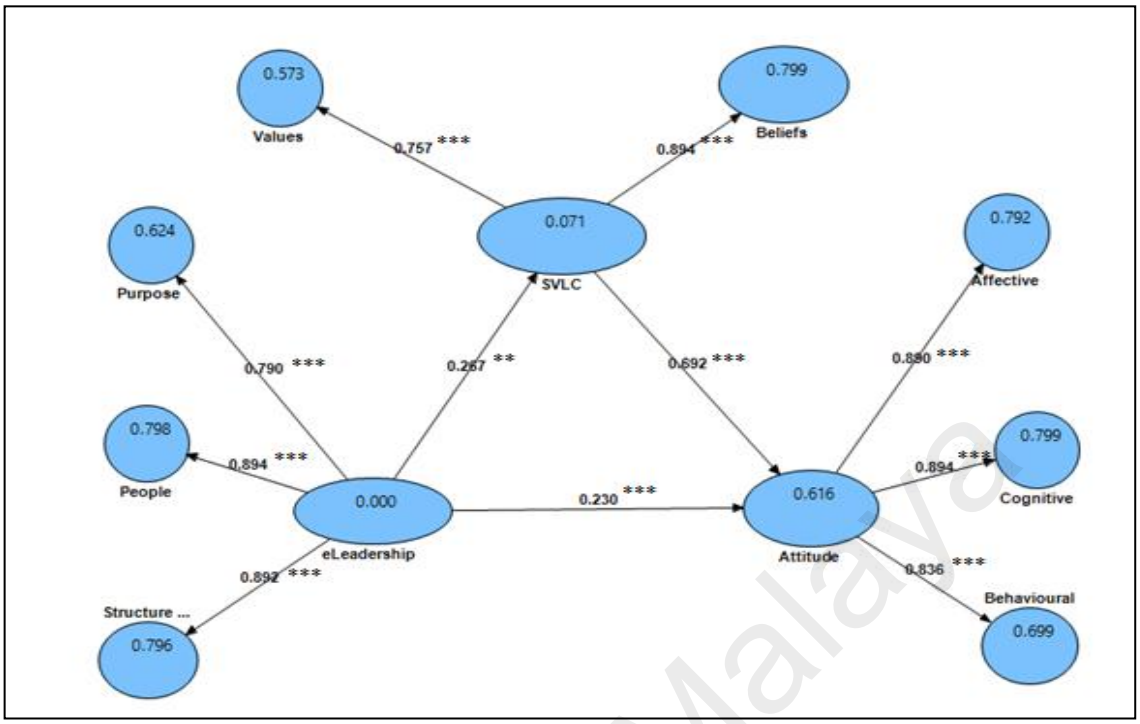

Figure 4.4: Mediation Model for School Virtual Learning Culture on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.49: T-statistics, Standardized regression weight (β), and R^2 of the Relationship between Principal E-Leadership Practices, School Virtual Learning Culture and Teacher Attitude toward Using Frog VLE

Regression			T-statistics	Result	β	R^2	Effect
Independent variable		**Dependent variable**					
E-leadership	→	SVLC	2.8986**	Significant	.2672	.0714	Mediating = .2672 x .6916 = .1848
SVLC	→	Attitude	11.9928***	Significant	.6916	.6163	
E-leadership	→	Attitude	4.8795***	Significant	.2300	.6163	Direct

Note: SVLC = School Virtual Learning Culture; *Significant at p<.05; **Significant at p<.01; ***Significant at p<.001

By referring to Table 4.49, the t-statistics values for the individual path school virtual learning culture-attitude (β= .6916, t= 11.9928, p<.001); e-leadership-attitude (β= .2300, t= 4.8795, p<.001); and e-leadership-school virtual learning culture (β= .2672, t= 2.8986, p<.01) are greater than 1.96 and it is statistically significant.

Besides, according to Table 4.49, R^2 for teacher attitude toward using Frog VLE is equal to .6163, it is interpreted as, with the help of principal e-leadership and school virtual learning culture, teacher attitude toward using Frog VLE would be maximized to 61.63%. In other word, a total of 61.63% of teacher attitude toward using Frog VLE is due to principal e-leadership practices and school virtual learning culture. However, Table 4.49 shows that there is only a total of 7.14% of school virtual learning culture is due to principal e-leadership practices.

Based on Table 4.49, there is a significant indirect effect of school virtual learning culture on the relationship between principal e-leadership practices and teachers' attitude toward using Frog VLE. Both principals' e-leadership practices to school virtual learning culture ($t=2.8986$, $p<.01$) and school virtual learning culture to teachers attitude ($t=11.9928$, $p<.001$) shows statistically significant result. In addition, there is also significant direct effect of the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE ($t=4.8795$, $p<.001$). When there is a direct effect between the causal variable and the outcome variable, it indicated that partial mediating effect occurs (Baron & Kenny, 1986). Hence, results showed that there is partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

Furthermore, the total effect of principal e-leadership practices on teacher attitude toward using Frog VLE is increased from .2300 to .4148 when school virtual learning culture entered the model (Refer to Table 4.49 and Figure 4.5). Hence, it confirmed that school virtual learning culture enhances the relationship between principals' e-leadership and teachers' attitudes toward using Frog VLE.

On the other hand, the effects of school virtual learning culture on the relationship between principals' e-leadership and teachers' attitude toward using Frog VLE are depicted in Figure 4.5. According to Wong (2016), the total effect is equal to direct effect plus indirect effect (mediating effect). Therefore, the total effects of e-leadership practices on teachers' attitude are equal to .4148 (.2300 + .1848) at a significant level of $p<.05$. It showed that principal e-leadership practices and school virtual learning culture have moderate effect on teacher attitude toward using Frog VLE in Klang district secondary schools based on Muijs' table of beta value and strength of effect size (Refer to Table 3.12).

Total effect = direct effect + mediating effect

= .4148 (Significant)

Mediating effect =.2672 x .6916 = .1848 (Significant)

Direct effect = .2300 (Significant)

Note: Partial mediating effect occurs when there is a significant mediating effect and there is direct significant effect between principals' e-leadership and teachers' attitude toward using Frog VLE (Baron & Kenny, 1986)

Figure 4.5: Effect of School Virtual Learning Culture on the Relationship between Principals' E-Leadership and Teachers' Attitude toward Using Frog VLE

In conclusion, based on Table 4.49, it can be concluded that there is a partial mediating effect of school virtual learning on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. The school virtual learning culture enhances the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. It is a significant and positive mediating effect.

4.4.12 Research Question 12

Is there any moderating effect of teachers' demographic characteristics on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?

This research question intended to address the effect of teachers' demographic characteristics such as gender, age, computer experiences and teaching experiences as moderating variable in the relationship between principal e-leadership practices (independent variable) and teacher attitude toward using Frog VLE (dependent variable) in a model. Moderating variable is the variable that affects the direction or the strength of the relation between an independent variable and a dependent variable (Baron & Kenny, 1986). PLS-SEM was used to perform the moderation analysis in this study. It was utilized to test the direct and moderating relationship between principal e-leadership practices (independent variable), teacher attitude toward using Frog VLE (dependent variable); and teachers' demographic characteristics such as gender, age, computer experiences and teaching experiences (moderating variable).

A moderation model includes the moderating variable is presented and the significance of the direct and moderating effect are then checked using bootstrapping. The moderating effect is measured through t-statistics as PLS-SEM generates t-statistics for significance testing between interaction effect of the moderator and the independent variables on the dependent variables. If the interaction effect is significant, the moderator has a significant moderating effect on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Hence, it could be concluded that the moderating effect exists and the moderator could be confirmed as a significant moderator. In the following section, the researcher would perform the moderating effect of teachers' demographic variables (gender, age, computer

experiences and teaching experiences) on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.4.12.1 Gender

The moderating model for gender on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE is as shown in Figure 4.6. In addition, t-statistics of the relationship between principal e-leadership practices, gender, and teacher attitude toward using Frog VLE are presented in Table 4.50.

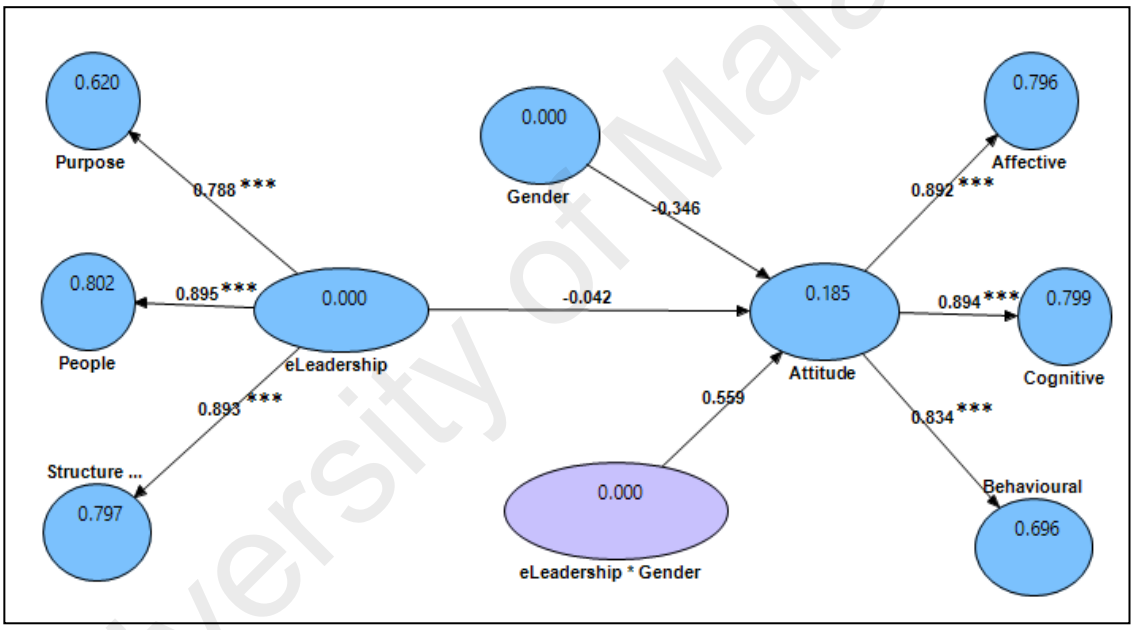

Figure 4.6: Moderation Model for Gender on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.50: T-statistics of Gender as Moderating Variable on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Regression Path			T-statistics (Bootstrapping value)	Result
Gender	→	Attitude	1.0591	Not Significant
E-leadership	→	Attitude	0.0815	Not Significant
E-leadership *Gender	→	Attitude	0.9492	Not Significant

Based on Table 4.50, it show that the direct effect of principal e-leadership practices to teacher attitude toward using Frog VLE were not significant (t=0.0815) at the .05 level (p>.05). In addition, the interaction between principal e-leadership practices and gender were not significant as well (t=0.9492, p>.05). This indicated that there were no statistically significant differences of gender on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Hence, gender is not a significant moderator of the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. It means there is no significant different between male and female for the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.4.12.2 Age

The moderating model for age on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE is as shown in Figure 4.7. In addition, t-statistics of the relationship between principal e-leadership practices, age, and teacher attitude toward using Frog VLE are presented in Table 4.51.

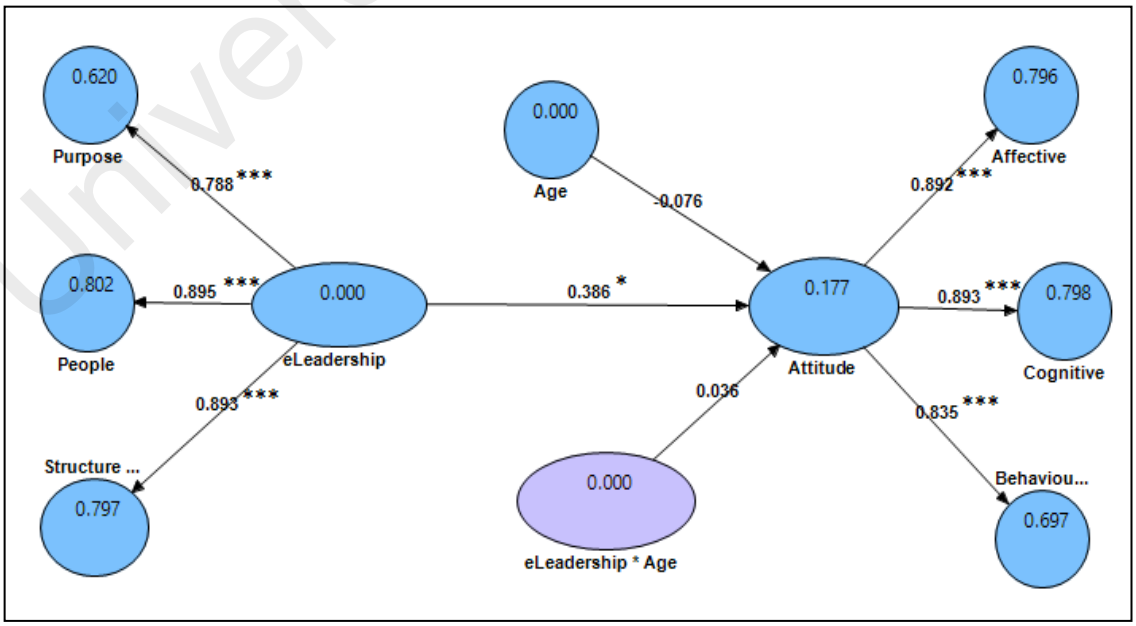

Figure 4.7: Moderation Model for Age on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.51: T-statistics of Age as Moderating Variable on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Regression Path			T-statistics (Bootstrapping value)	Result	Standardized Regression weight (β)
Age	→	Attitude	0.4091	Not Significant	-0.076
E-leadership	→	Attitude	2.0331*	Significant	.3865
E-leadership *Age	→	Attitude	0.1444	Not Significant	.0361

*Significant at p<.05; **Significant at p<.01; ***Significant at p<.001

Based on Table 4.51, it show that the direct effect of principal e-leadership practices to teacher attitude toward using Frog VLE were significant (t=2.0331, β = .3865) at the .05 level (p<.05). However, the interaction between principal e-leadership practices and age were not significant (t=0.1444, β = .0361, p>.05). This indicated that there were no statistically significant differences of age on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Hence, age is not a moderator for the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.4.12.3 Computer Experiences

The moderating model for computer experiences on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE is as shown in Figure 4.8. In addition, t-statistics of the relationship between principal e-leadership practices, computer experiences and teacher attitude toward using Frog VLE are presented in Table 4.52.

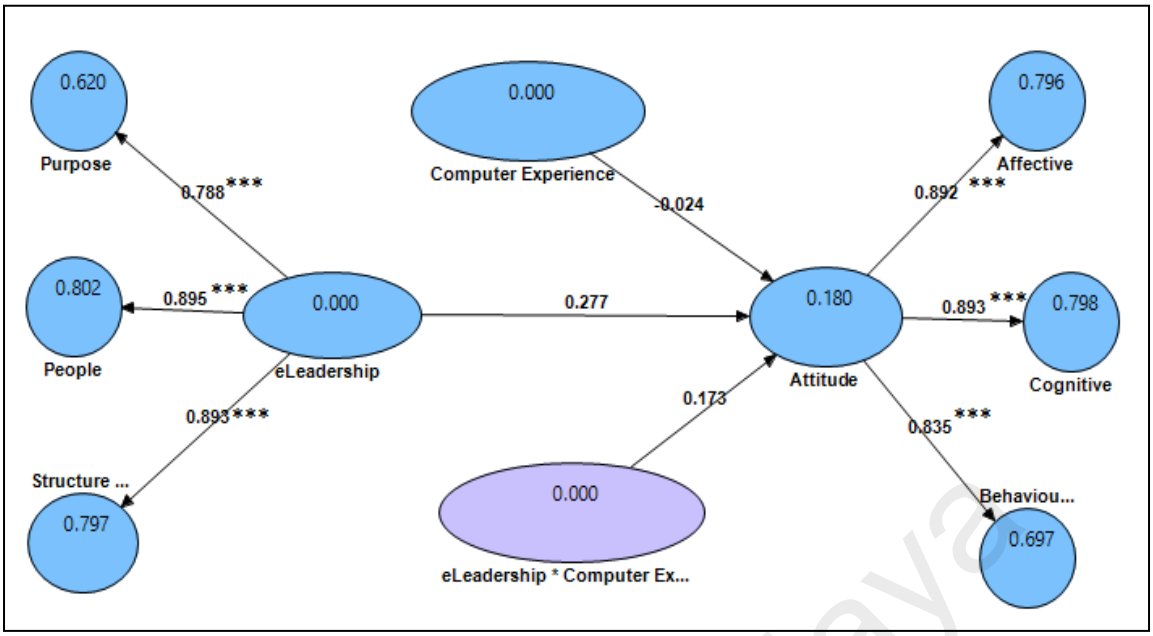

Figure 4.8: Moderation Model for Computer Experiences on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.52: T-statistics of Computer Experiences as Moderating Variable on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Regression Path			T-statistics (Bootstrapping value)	Result
Computer Experience	→	Attitude	0.1069	Not Significant
E-leadership	→	Attitude	0.7805	Not Significant
E-leadership*Computer Experience	→	Attitude	0.4143	Not Significant

Based on Figure 4.52, it show that the direct effect of principal e-leadership practices to teacher attitude toward using Frog VLE were not significant (t=0.7805) at the .05 level (p>.05). Besides that, the interaction between principals' e-leadership practices and computer experiences were not significant as well (t=0.4143, p>.05). This indicated that there were no statistically significant differences of computer experiences on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Hence, computer experiences do not influence the strength of the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.4.12.4 Teaching Experiences

The moderating model for teaching experiences on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE is as shown in Figure 4.9. In addition, t-statistics of the relationship between principal e-leadership practices, teaching experiences and teacher attitude toward using Frog VLE are presented in Table 4.53.

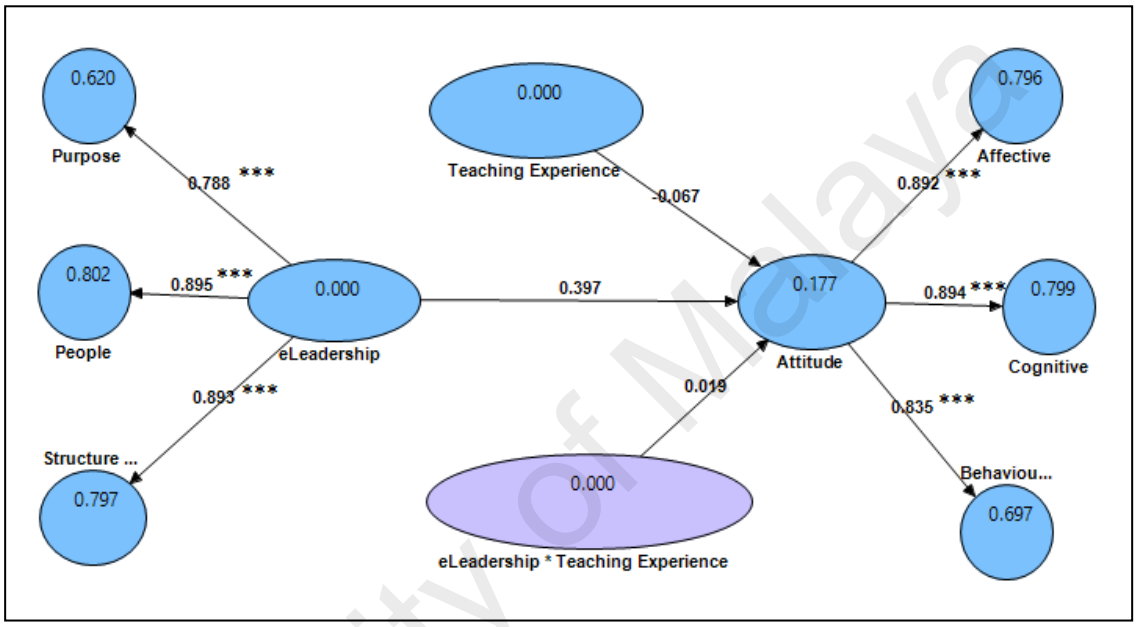

Figure 4.9: Moderation Model for Teaching Experiences on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Table 4.53: T-statistics of Teaching Experiences as Moderating Variable on the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

Regression Path			T-statistics (Bootstrapping value)	Result
Teaching Experience	→	Attitude	0.3217	Not Significant
E-leadership	→	Attitude	1.5244	Not Significant
E-leadership *Teaching Experience	→	Attitude	0.0632	Not Significant

Based on Table 4.53, it show that the direct effect of principal e-leadership practices to teacher attitude toward using Frog VLE were not significant (t=1.5244) at the .05 level (p>.05). In addition, the interaction between principals' e-leadership practices and

teaching experiences were also not significant (t=0.0632, p>.05). This indicated that there were no statistically significant differences of teaching experiences on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Hence, teaching experiences is not a significant moderator of the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

4.5 Summary

This chapter presents the findings of the data collected from 351 secondary school teachers in Klang district secondary school. Both descriptive and inferential statistics were used to analyze the data collected in order to answer the twelve research questions proposed for this study. The findings for each of the research questions are summarized in Table 4.54.

Table 4.54: Summary of Research Findings

Research questions	Research findings
1. What is the level of teachers' attitude toward using the Frog VLE in Klang district secondary schools?	Teachers in Klang district, Selangor secondary schools showed **medium level** of attitude toward using Frog VLE.
2. What is the level of e-leadership of school principal toward using the Frog VLE in Klang district secondary schools?	Teachers perceived that their principals demonstrated **medium level** of e-leadership practices in Klang district secondary schools.
3. What is the level of computer mediated communication (CMC) competence of teachers toward using the Frog VLE in Klang district secondary schools?	Teachers in Klang district, Selangor secondary schools showed **medium level** of CMC competence toward using Frog VLE.
4. What is the level of school virtual learning culture toward using the Frog VLE in Klang district secondary schools in Klang district secondary schools?	Teachers in Klang district, Selangor secondary schools perceived that their school demonstrated **medium level** of school virtual learning culture toward using Frog VLE.
5. Is there any relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?	There is **weak statistically significant positive correlation** between principal e-leadership practices and teacher attitude toward using Frog VLE.

Table 4.54 continued

Research questions	Research findings
6. Is there any relationship between principal e-leadership with teacher CMC competence toward using the Frog VLE in Klang district secondary schools?	There is **weak statistically significant positive correlation** between principal e-leadership practices and teacher CMC competence toward using Frog VLE.
7. Is there any relationship between teacher CMC competence with teacher attitudes toward using the Frog VLE in Klang district secondary schools?	There is **moderate strong statistically significant positive correlation** between teacher CMC competence and teacher attitude toward using Frog VLE.
8. Is there any relationship between principal e-leadership practices with school virtual learning culture in Klang district secondary schools?	There is very **weak but statistically significant positive correlation** between principal e-leadership practices and school virtual learning culture.
9. Is there any relationship between school virtual learning culture with teacher attitudes toward using the Frog VLE in Klang district secondary schools?	There is **strong statistically significant positive correlation** between school virtual learning culture and teacher attitude toward using Frog VLE.
10. Is there any mediating effect of teachers' CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools?	There is a **full mediating effect** of teacher CMC competence on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.
11. Is there any mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?	There is a **partial mediating effect** of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.
12. Is there any moderating effect of teachers' demographic characteristics on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools?	Teachers' **demographic variables such as gender, age, computer experiences, and teaching experiences were not** found to be statistically significant as **moderators** in the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

The findings summarized above provide the basis for the discussions of findings in Chapter 5 that will include a brief review of the findings, a discussion of the findings, and the conclusions that can be made from the findings. Recommendations for research, implications, and conclusion are also presented in the final chapter, Chapter 6.

CHAPTER 5: DISCUSSIONS OF FINDINGS

5.1 Introduction

This chapter first presents the summary of this study. Next, the discussion on the results of the study supported by relevant literature through interpretation of data analysis results in chapter four is presented. The discussions were based on the objectives of the study outlined in chapter one.

5.2 Summary of the Study

The core purpose of this study is to investigate whether principal e-leadership practices have a direct relationship with teacher attitude toward using Frog VLE or it is mediated by the teacher CMC competence and school virtual learning culture. Hence, teachers' perception on the level of principal e-leadership practices, teacher CMC competence toward using Frog VLE, school virtual learning culture and teacher attitude toward using Frog VLE were measured and the relationship among these variables in Klang district secondary schools was identified. The major findings of this study are summarized according to the research questions and are presented in Chapter 4 (Refer to Table 4.54). Discussions on the results of the study based on each of the research questions are presented in the next section.

5.3 Discussions

This study aims to investigate teachers' perception on the level of principal e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE and the relationships among these variables in Klang district secondary schools. The objectives of this study are as follows:

1. To identify the level of teacher attitude, school principal e-leadership, teacher computer-mediated communication (CMC) competence, and school virtual learning culture toward using the Frog VLE in Klang district secondary schools.
2. To identify the relationship between principals' e-leadership with teacher computer-mediated communication (CMC) competence, school virtual learning culture, and teachers' attitudes toward using the Frog VLE in Klang district secondary schools.
3. To explore the mediating effects of teachers' CMC competence on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools.
4. To explore the mediating effects of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE in Klang district secondary schools.
5. To assess the moderating effects of teachers' demographic characteristics on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE in Klang district secondary schools.

By referring to the five research objectives as described above, twelve research questions were proposed for this study. Results of data analysis that reported in chapter four were presented based on each of the research questions proposed in chapter one. Similarly, the following sections in this chapter will provide a discussion of the findings based on each of the research questions highlighted in chapter one and supported by relevant literature in chapter two. The discussions are intended to provide answers to the research questions proposed and to achieve the research objectives of this study.

5.3.1 The Level of Teacher Attitude toward Using Frog VLE

Technological advancement has put on greater pressure on the shoulder of teachers to engage with various types of technology tools in preparing, delivering and conceptualizing their ways of instruction (Teo, 2015). Celep & Tülübaş (2014) stated that teachers' attitude is important in initiating the use of technology in school's program and to effectively integrate technology in school. However, the authors added that without teachers' genuine efforts it does not seem possible to effectively integrate ICT in school. Teachers need to possessed positive attitudes toward ICT in order to successfully coordinated ICT into the classroom and the school curriculum (Teo, 2008; Mojgan et al., 2009). In Malaysia, a newly launched virtual learning environment platform known as Frog VLE aimed to transform education in the country by seeing more technology use in the classroom. Hence, it is vital to examine teachers' attitude toward using the Frog VLE, as we all know if teachers do not see the need in technology they will not use the technology infrastructures provided.

As presented in the previous chapter, the descriptive analysis of data from 34 schools included in this study indicated that teachers in Klang district, Selangor secondary schools showed medium level of attitude toward using Frog VLE. This could be interpreted as teachers in Klang district secondary schools demonstrated moderately positive attitudes toward using Frog VLE. Similarly, both Chai et al. (2009) and Tezci (2010) indicated that teachers in their study demonstrated medium level of attitude toward the computer. Chai et al. (2009) stated that both Singaporean and Taiwanese pre-service teachers expressed moderately positive attitudes toward ICT use. Furthermore, the findings of this research confirm those of Albirini (2006), Cakir (2014), Celep & Tülübaş (2014), Demirci (2009), Harrison & Rainer (1992), Kandasamy & Parilah (2013), Mojgan et al. (2009), Teo (2008), Williams (2015),

Yildirim (2000), and Yunus (2007) on computers and the Internet. These researches concluded that teachers had positive attitudes toward using educational technology innovations. On the other hand, the findings of this research are contradict to Samuel & Zaitun (2007) findings which indicated that teachers possessed negative attitudes and they were generally unwilling to integrate ICT tools into the classroom.

In fact, this finding is also an excellent indicator of where these teachers still have space for improvement in terms of attitude toward using Frog VLE as all the three dimensions namely, affective (M=5.88, S.D.=2.04); cognitive (M=5.472, S.D.=2.04); and behavioural (M=5.12, S.D.=2.16) showed medium level of mean.

In affective dimension, the respondents showed high level of agreement on the statements that Frog VLE does not scare them at all, this indicated that the respondents do not fear or afraid toward using Frog VLE. This is further supported by Juanna Risah et al. (2005) stated that teachers demonstrated low level of anxiety where the samples do not scare toward using ICT. However, the respondents showed medium level of agreement on the statement using Frog VLE is enjoyable and they are glad that there is Frog VLE these days. This might due to the heavy work load of teachers, lack of Frog VLE related training, and limited access to Frog VLE. According to both Bingimals (2009) and Buabeng-Andoh (2012), lack of pedagogical teacher training, lack of time and limited access to ICT are some factors that prevent teachers from using ICT. Many teachers agreed that they faced challenges such as lack of time; lack of ICT technical support specialist, insufficient professional development on how to integrate ICT and insufficient funding while integrating ICT in Malaysian schools (Arumugam & Abdul Halim, 2013).

In cognitive dimension, the respondents showed medium level of agreement on the statements that Frog VLE is an efficient means of getting information; would motivate students to study; enhances student's learning and saves effort. Porter & Donthu (2006) mentioned that perceived ease of use and perceived usefulness are strongly correlated to attitude toward Internet usage. Furthermore, Al-Gahtani (2011) documented that perceived usefulness of the technology and perceived ease of use are the key antecedent variables affecting attitudes toward the technology. In other words, if teachers perceived that Frog VLE is not useful they will possess negative attitude toward using Frog VLE. One possible explanation that teachers showed medium level of agreement on the usefulness of Frog VLE might due to lack of Frog VLE related training. This is further supported by Samual & Zaitun (2007) indicated that training is an important factor in ensuring successful implementation of ICT. Besides, high experiences with computer training are significantly correlated with computer use and have an impact on teachers' attitude toward computer use (Van Braak et al., 2004). This could be interpreted as if teachers have adequate training on Frog VLE, they are more likely to possess a positive attitude and more likely to use the platform.

In behavioural dimension, the respondents showed medium level on the statement they would like to learn more about Frog VLE, this mean that teachers do not have the feeling of dislike toward using Frog VLE. This finding is consistent with the study conducted by Juanna Risah et al. (2005) who found that the samples showed low level of aversion where they do not have negative reactions toward using ICT. On the other hand, the respondents rated lower level of agreement on the statement they have no intention to use Frog VLE in the near future; they would avoid using Frog VLE as much as possible; and they would rather do things manually than using Frog VLE. This mean that the respondents actually do not have the feeling of dislike or hatred toward using

Frog VLE as they hope to use Frog VLE and do not avoid using it in the near future. Thus, it can be concluded that there is a possibility to increase the usage of Frog VLE among teachers as they possess moderately positive attitude.

In conclusion, the data indicated that teachers in Klang district, Selangor secondary schools showed medium level of attitude toward using Frog VLE. The three dimensions of attitude such as affective, cognitive and behavioural showed medium level of mean. Liaw et al. (2007) indicated that the affective measurement (such as perceived enjoyment) and the cognitive measurement (such as perceived usefulness) are significant predictors of behavioural measurement (such as behavioural intention to use ICT). In this study, the respondents perceived that Frog VLE is moderately enjoyable; perceived that Frog VLE is moderately useful with regard to getting information, save effort, motivate and enhance students' learning. Besides, it also showed moderately behavioural intention to use Frog VLE. Hence, in order to increase Frog VLE usage among teachers in Malaysian secondary schools, the related authorities should look into those factors that might increase teachers' attitude toward using Frog VLE from the perspective of teachers' perceived enjoyment, perceived usefulness and behavioural intention to use Frog VLE.

5.3.2 The Level of Principal e-Leadership Practices

"A school's internal administration is no longer a closed-circuit system but rather a dynamic educational ecology" (Chang, 2012, p.337). Schools can no longer ignore the influence of technological development outside of the school. In particular, schools in the digital age can no longer face the rapidly changing world with an attitude that hopes to preserve the past. Similarly, the role of the principal has also changed as the arrival of ICT has affected the roles and responsibilities of school principals in huge ways

(Mohammed Sani et al., 2013). The role of the principal has shifted from solely a school manager of school that taking care of stuff to the current, multi-faceted role of e-leader that influence people to carry out the mission and vision of the school (Chang, 2012). Therefore, the most important task of a principal is to figure out how to become an appropriate e-leader. Now, a principal can then guide teachers to improve their technological literacy such as computer-mediated communication competence and to improve pedagogical effectiveness and students' learning outcomes through an e-learning platform.

Analysis of the data regarding teachers' perceptions of school principals' e-leadership showed that school principals demonstrated medium level of e-leadership practices in Klang district secondary schools. However, purpose dimension of principal e-leadership toward using Frog VLE showed high level (M=7.13, S.D.=1.66) of mean. This finding reflected that principals in Klang district secondary schools have realized their role as e-leaders and they are capable of playing e-leadership role in their daily practices as observed by their teachers with regard to purpose dimensions in terms of providing support; clear vision; attainable goal; keeping students learning as centre of decision making; and support pedagogic use of Frog VLE. This might due to the principals have learned about how technology could help in school management and instructional purposes during the training programs that they have attended. This is because developing a clear vision and attainable goal for technology are considered to be a priority for an effective e-leadership (Fullan, 2003; Jensen, 2012; Schiller, 2003; Sohawon et al., 2015; Vázquez Cano, 2013; Yuen et al., 2003; Zaccaro & Bader, 2003).

The respondents also perceived that their principals keep student learning at the centre of ICT decision making and has a continuous dialogue about the pedagogic use

of Frog VLE with them. This showed that the principals are concerned about students' learning outcome and pedagogical quality through Frog VLE usage. This is in line with Arokiasamy et al. (2015); Blau & Presser (2013) and Sujo-Montes & Gallagher (2011) findings where successful e-leaders are those who able to prioritize students learning outcome and monitor pedagogical use of technology in teaching and learning process.

Furthermore, if leadership does not provide a clear direction and creates inconsistencies then the leadership system may drag down the whole organization (Avolio & Kahai, 2003). Therefore, it is important that school principals try to understand the direction of technology development and maintain a clear vision and attainable goal as well as having necessary communication skills to convey this understanding and vision to the teachers (Zaccaro & Bader, 2003).

On the other hand, the finding indicates teachers partially agree that their school principals are e-leaders with regard to people (M=4.09, S.D.=2.46) dimension and structure and social system (M=4.76, S.D.=1.91) dimension, which might mean that the respondents have higher expectations from their school principals as an e-leader from the perspective of people and structure and social system.

In people dimension, according to the respondents, as e-leaders, their school principals seem to be less communicative and cooperative in terms of creates a fixed schedule for responding to their messages; responds at least one times per day to their messages; and allocates funds to let Frog VLE-capable teachers spend time coaching their colleague. This could be interpreted as the school principals might not be as future oriented as expected in promoting the use of Frog VLE at school. Also, they might not be using Frog VLE efficiently for better communication with teachers, students and

parents. According to Blau & Presser (2013), Chang (2012), and Jameson (2013), successful e-leaders are those who able to have continuous e-communication with teachers, students and parents in terms of providing support and speed of response. Hence, school leaders should have the awareness regarding the importance of continuous e-communication in leading a team through virtual setting.

Besides, successful e-leaders are those who able to delegate responsibilities and enhance collaboration between followers (Adu & Olatundun, 2013; Blau & Presser, 2013; Vázquez Cano, 2013). For example, allocates funds to let Frog VLE-capable teachers spend time coaching their colleague. In such a way that principals are able to share his or her responsibilities in terms of providing training and development for the teachers at the mean time improve teacher computer-mediated communication competence and technology literacy.

In structure and social system dimension, the respondents showed higher level of agreement on the statement their principals provides resources to support teachers' professional development, which indicated that the school principals are very supportive in terms of providing resources for teachers professional training and development with regard to Frog VLE. As stated by Adu & Olatundun (2013), plan a training program for teachers is a good way in helping school principals to manage school technology.

On the other hand, the statement we can access up-to-date information through Frog VLE showed medium level of mean. These reflected that teachers found that they can access up-to-date information through Frog VLE. However, the respondents showed lower level of agreement on the statement they use Frog VLE in meetings. According to Chang (2012), technology leader should remember not to only focused on hardware and

involve only the technology but also to integrate the technology into school. For example, to use the e-learning platform and integrate into their routine practices such as use it during the meetings. Similarly, Kearsley & Lynch (1994) indicated that great technology leadership is able to allow more efficient administrative operations to take place through the use of technology. Hence, school principals are advice to integrate Frog VLE into their daily practices since teachers found that Frog VLE is less utilize in the meetings.

Lastly, teachers in Klang district secondary schools perceived that their principal seldom use Frog VLE to attend presentations in real time without having them to meet face to face as the mean score for this items is the lowest among all the items in structure and social system dimension. This is in line with the findings of Gryzelius (2015) who documented that the usage of ICT tools in Malaysian schools context remains inefficient. It is thus suggested that school leaders need to bear some responsibility in enhancing the usage of ICT platform such as Frog VLE and increase the productivity of administrative operations.

In conclusion, the findings reflected that teachers perceived their principals demonstrated medium level of e-leadership practices in Klang district secondary schools and it shows that principals demonstrated higher level of e-leadership practices in terms of purpose as compared to people and structure and social system dimensions. By referring to the findings of this study, schools principals seem to understand the importance of having a clear vision; attainable goal; providing support; keeping students learning as centre of decision making; and support pedagogic use of Frog VLE but pay less concern on communicating and cooperating toward the use of Frog VLE. Hence, school principals need to pay more attention on creating a fixed schedule for responding

to teachers messages through Frog VLE; responding at least one times per day to teachers messages through Frog VLE; allocating funds to let Frog VLE-capable teachers spend time coaching their colleague; providing resources to support teachers' professional development; allowing access up-to-date information through Frog VLE; allowing the use of Frog VLE in meetings; and allowing Frog VLE to attend presentations in real time without having to meet face to face.

5.3.3 The Level of Teacher CMC Competence

With the advance of emerging ICT and the growing interest in using the Internet for education, a variety of new ICT tools had been introduced and present teachers with new opportunities for computer-mediated communication (CMC). Wu et al. (2014) stated that CMC not just facilitates both individual-to-group and individual-to-individual communication through networks but created new opportunities for teachers to interact personally, socially and professionally with other fellow teachers as well. However, Bakic-Tomic et al., (2015) indicated that teachers are not aware of their lack of communication knowledge and adequate communication skills. Additionally, the authors concluded that communication competences of teachers are equally necessary for teachers' success as pedagogical skills. Thus, it is critical to investigate the level of teachers' computer-mediated communication competencies in this era of technology advancement where education emphasized more on blended learning with the increasing proliferation and prioritization of virtual learning environment.

The descriptive analysis of data indicated that teachers in Klang district, Selangor secondary schools showed medium level of CMC competence toward using Frog VLE. All three dimensions for teacher CMC competence (motivation, knowledge, and skills) have mean that are interpreted as medium level. The highest mean among the three

dimensions of CMC competence was motivation (M=4.45, S.D.=2.03), followed by skills (M=4.10, S.D.=2.00) and lastly knowledge (M=4.08, S.D.=2.15) dimension.

In motivation dimension, the respondents showed medium level of agreement on the statements that they like tinkering with options to make their messages through Frog VLE more effective; they enjoy communicating using Frog VLE; communicating through Frog VLE relieves some of their tension; and they look forward to sitting down at their computer to write to others through Frog VLE. This indicated that they are moderately motivated to use Frog VLE, this can be supported by the findings of this study where the teachers' perceived that they are still lacking of knowledge and skills regarding how to utilize Frog VLE as stated in Chapter 4. This can also support by path-goal theory which suggests that if followers think they are capable or felt competent, they will be motivated (Northouse, 2013). This means that if the teachers' does not have adequate knowledge and skills if they are not competent enough, they will be less motivated toward using the Frog VLE. Furthermore, Sherblom et al. (2013) found that students are more likely to participate in online discussion when they are motivated.

In knowledge dimension, the respondents showed medium level of agreement on the statements that never at a loss in using Frog VLE to say something; very knowledgeable about how to communicate through Frog VLE; familiar with communication through Frog VLE. This can be interpreted as the teachers' in Klang district secondary school perceived that they are still lacking of knowledge regarding how to utilize Frog VLE. This is supported by Rosnaini & Mohd Arif Hj (2010) in their study indicated that majority of the teachers had average knowledge in ICT and there is even a group of teachers demonstrated a minimal level of knowledge toward using ICT. Similarly, Kandasamy & Parilah (2013) also found that teachers do not acquire the necessary level

of ICT related knowledge. The moderate levels of teachers' knowledge on Frog VLE might result from the fact that this virtual learning environment requires technical knowledge and training. This is further supported by Tezci (2010) stated that teachers who previously trained about computers had higher levels of use than those who did not receive any training.

In skills dimension, the respondents showed medium level of agreement on the statements that they have no trouble expressing their opinions forcefully on Frog VLE messages; they show compassion through the way they write messages; they use a lot of the expressive symbols [e.g.,''smile''] in their Frog VLE messages; and they receive a message from someone, they reply within 24 hours. This can be interpreted as the teachers in Klang district secondary school perceived that they are still lacking in skills regarding how to utilize Frog VLE. These findings is in line with the findings of both Samuel & Zaitun (2007) and Yunus (2007) indicated that teachers are lack of ICT-related skills.

This was probably due to limited training provided to the teachers and also due to insufficient internal training that able to produce a significant impact on teachers' skills. Further supported by Kaur & Noorma (2015) who found that skills in accessing Frog VLE are not significantly correlated with teachers' attitudes toward using Frog VLE after attending the training. This indicated that the Frog VLE courses that the teachers attended are not sufficient to give an impact on teachers' skills in accessing Frog VLE. Therefore, relevant authorities should not view internal training as a mean of teachers to successfully use Frog VLE. On the other hand, they should implement more effective training strategies to enhance teachers' confidence, skills, knowledge and positive attitude (Kaur & Noorma, 2015). Besides, it is compulsory to train teachers'

communication skills both at the beginning of the training session and consistently in the teaching profession. (Zlatić et al., 2014)

On contrary, this finding rejected the results of the study conducted by Irfan Naufal & Mohamad Tarmizi (2014) on the levels of Malaysian teachers' ICT skills, namely, basic and advanced ICT skills, Internet skills for information seeking and sharing as well as Internet skills for communication showed that respondents are highly competent in ICT for communication purposes. This could be explained by the fact that these researchers focusing on general teachers' ICT and Internet skills for information seeking and sharing as well as communication purpose, whereas this study focuses particularly on the virtual learning environment known as Frog VLE. As Frog VLE is a newly developed virtual learning environment implemented to all 10,000 schools in Malaysia, hence, it is not fully utilized yet and teachers are still not familiar with it.

In conclusion, the findings reflected that teachers showed medium level of CMC competence toward using Frog VLE. All three dimensions of teacher CMC competence (motivation, knowledge, and skills) have mean that are interpreted as medium level. This indicated that teachers in Klang district secondary school are lack of knowledge and skills and moderately motivated toward the use of Frog VLE. By referring to the findings of this study, researcher argues that it is vital to enhance teachers' CMC competence in order to increase the usage of Frog VLE among teachers. This is because CMC competences have a significant relationship with end user's experience and use (Spitzberg, 2006). This is supported by Chua & Chua (2017a) indicated that great e-leaders are those who able to provide clear vision and mission for networking and able to provide training pertaining teachers' computer-mediated communication competence. This is because teachers' CMC competence could help to build a positive relationship

between principal and teachers and subsequently help to increase the usage of e-learning platform (Chua & Chua, 2017b).

5.3.4 The Level of School Virtual Learning Culture

School cultural change plays a significantly prominent role in ensuring effective implementation of technology and its sustainability into classroom instructions (Tan, 2010). In addition, discouraging school culture always lead to a lack of communication among teachers which in turn impact the implementation of ICT in school (Koszalka, 2001). Culture and context are the barriers to the integration of technology in education (Chai et al., 2009). Hence, principals and teachers need to understand the established culture and reform history of the school in order to implement ICT successfully (Yuen's et al., 2003).

The data of this study indicated that teachers in Klang district, Selangor secondary schools perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE. Both values and beliefs dimensions have mean that are interpreted as medium level. The highest mean among the two dimensions of school virtual learning culture was beliefs dimension (M=5.93, S.D.=2.02) and followed by values (M=5.14, S.D.=2.10) dimension.

In beliefs dimension, the respondents showed medium level of agreement on all the four statements. This shows that teachers perceived that the impact of Frog VLE on students, teachers and education is moderate. This is also indicated that they did not prevent Frog VLE by indicating that students need to know how to use Frog VLE for their future jobs and Frog VLE should be a priority in education. The study results is consistent with Albirini (2006) findings shows that Syrian teachers saw ICT as

culturally appropriate for Syrian schools and society and they did not reject the implementation of ICT.

In addition, the respondents showed moderate positive perceptions regarding the impact of Frog VLE on them by partially agree to the statement people who use Frog VLE will have better skills in ICT and the increased proliferation of Frog VLE will make their work easier. This can be concluded as the teachers did not feel Frog VLE as a threat to them and partially believed that Frog VLE will make them have better skills and make their work easier. This is in line with Arokiasamy et al. (2015) findings, indicated that Malaysian school principals do not see the computer as a threat for Malaysia culture and the value, relevance and impact of ICT is related to the cultural norms in Malaysia schools.

In values dimension, the respondents showed medium level of agreement on the statements that Frog VLE will not make any difference in their classrooms and schools and students prefer learning from teachers than to learn from Frog VLE. This indicated that the respondents only partially believe that Frog VLE is relevant and will make a different in their daily practices and students' learning. This was probably due to inefficient Internet access and time-consuming efforts to produce teaching material through Frog VLE. Further supported by Bingimals (2009) who mentioned that lack of time and lack of access to the resources was the barriers faced by teachers during the integration of ICT.

On contrary, Albirini (2006) findings show that Syrian teachers had positive or highly positive cultural perceptions about the relevance of ICT to them which is contradicting to the findings of this study. This might due to the fact that the ICT

barriers faced by Syrian teachers are different from Malaysian teachers. As we know, a different country will have different culture and individuals from distinct culture will have different educational philosophies and beliefs which lead to different perceptions toward ICT usage (Jackson et al., 2008; Li, 2002; Nabeel et al., 2013; Sujo-Montes & Gallagher, 2011). Further supported by Rogers (1995) who underlined the significance of the cultural perceptions of teachers to the acceptance and use of ICT in the school of a given country. This means that it is important to study cultural perceptions of teachers toward using the technologies of a given country.

In conclusion, the findings reflected that teachers in Klang district, Selangor secondary schools perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE. These reflected that teachers perceived that the impact of Frog VLE on students, teachers and education is moderate and moderately agree that Frog VLE will make a different in their daily practices and students' learning. By referring to the findings of this study, researcher argues that it is vital to enhance school virtual learning culture in order to increase the usage of Frog VLE among teachers. This is further supported by Arokiasamy et al. (2015) and Lim et al. (2013) indicated that adoption of ICT is influenced by school culture. Besides, researchers argue that both school principals and teachers bear the responsibilities in ensuring high usage of Frog VLE through the process of inculcating positive school virtual learning culture. This argument is supported by both Gathungu et al. (2015) and Schiller (2003), stated that school principals can influence the development of school culture and Yuen's et al. (2003) stated that teachers also play an important role in implementing new ideas in enhancing school culture.

5.3.5 Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

According to Mishra et al. (2016), school leaders play a significantly important role in guiding the internal systems of a school, it is particularly relevant to the emergent interplay between organizational structures and the technology integrated within them. This is because leadership can impact the social structures of an organization that might foster or hinder the integration of ICT. Leaders is a crucial starting point to change the context where there is a chance that they can change a person's belief and behaviour (Fullan, 2003). In simple words, principals' leadership is the key factor to influence teachers' attitudes and is a success factor to increase the usage of Frog VLE as a tool to help teachers to carry out their daily practices.

The findings showed that there is statistically significant weak but positive correlation between principal e-leadership practices and teacher attitude toward using Frog VLE. This significant positive correlation reflected that the higher the level of principals' e-leadership practices, the higher the level of teachers' attitude toward using the Frog VLE. Thus, it is confirmed that principals' e-leadership practices is one of the factors that influence teachers' attitude toward using the Frog VLE. The correlation exists between principals' e-leadership practices and teachers' attitude toward using the Frog VLE could be supported by various leadership theories discussed in Chapter 2 (Bass, 1990; House, 1971; House & Mitchell, 1975; Jameson, 2013; Leithwood & Jantzi, 2006; Northouse, 2013) indicated that leadership is a social influence process that has an impact on followers' attitudes, behaviours, and performance.

In addition, the research findings support the notion that principals' leadership practices is positively correlated with teachers' attitude toward using the ICT (Aarons,

2006; Adegbesan, 2013; Kelloway et al., 2003; Kim, 2011; Kursunoglu & Tanrıogen, 2009; Lai & Yin, 1997; Liaw et al., 2007; Ling & Mohammed Sani, 2013; Ottestad, 2013). For instances, Aarons's (2006) result showed that transformational leadership were positively associated with providers' having more positive attitudes toward adoption of evidence-based practice and Adegbesan (2013) indicated that principals leadership styles and behaviours influence teachers' working attitude significantly. Further supported by Ottestad (2013) indicated that school principals' ICT leadership are associated with teachers' attitude and teachers' use of ICT in school.

On the contrary, Celep & Tülübaş (2014) found that principals' technological leadership had little impact on teachers' positive attitude toward the utilization of ICT and it is not significantly correlated with teachers' negative attitude. As the research is carried out in Turkey, the context and culture are different from Malaysian schools. Hence, teachers from two countries might have different perceptions regarding their principals' leadership practices and their attitudes toward using ICT. Further supported by Bingimals (2009) stated that barriers with regard to accessibility of ICT for teachers are common in most of the country but it is different in every country. Hence, it is not surprising that teachers from a different country have different perceptions regarding their principals' leadership practices and possessed different attitudes toward using the ICT.

In addition, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with the three teacher attitude toward using Frog VLE dimensions. However, the correlation strength between principal e-leadership practices and teacher attitude toward using Frog VLE is weak probably due to school principals do not use Frog VLE effectively in their daily practices or do not

communicate efficiently using Frog VLE with teachers, students and parents. This could be supported by the findings in Section 5.3.2 stated that teachers perceived that their principals seldom use Frog VLE in meetings and seldom use Frog VLE to attend presentations in real time without having them to meet face to face. Further supported by the findings that teachers perceived that their principals were less communicative and cooperative in terms of creates a fixed schedule for responding to their messages; responds at least one times per day to their messages; and allocates funds to let Frog VLE-capable teachers spend time coaching their colleague.

In conclusion, this study found that there is a statistically significant weak but positive correlation between principal e-leadership practices and teacher attitude toward using Frog VLE in Klang district secondary schools. Based on this finding, the researcher argues that principal e-leadership practices play a significantly important role in influencing teacher attitude toward using Frog VLE. Hence, related authorities should raise awareness with regard to the importance of principal e-leadership practices in order to foster positive attitude toward using Frog VLE among teacher to increase the usage of Frog VLE in Malaysian school. This is because principals' leadership is a critical factor to influence teachers' attitudes from the social perspectives (Liaw et al., 2007) and teachers' attitude is associated with ICT usage (Inan & Lowther, 2010; Kandasamy & Parilah, 2013; Porter & Donthu, 2006).

5.3.6 Relationship between Principal E-Leadership with Teacher CMC Competence toward using the Frog VLE

Communication is the first skill that school leaders should have when new ICT infrastructures are introduced in schools (Chang, 2012). The authors added that e-leaders must be able to provide support through proper communication. Besides,

Mojgan et al. (2009) stated that when teachers decide to adopt new ICT tools in schools they need principals technical support and administrative support. Principals need to ensure that teachers are competent in using CMC as a leader is crucial to the quality of CMC activity (Kaye,1992). Principals are believed to have influences on teachers' skills, knowledge and motivation toward using CMC (Kannan et al., 2012; Lord & Brown, 2001; Mwawasi, 2014; Van Niekerk, 2009).

The Spearman's rho correlation analysis showed that there is statistically significant weak but positive correlation between principal e-leadership practices and teacher CMC competence toward using Frog VLE. This implies that when principals practice higher level of e-leadership, the teacher CMC competence increase as well. The findings of this research confirmed principals' e-leadership practices as one of the factor that impact teacher CMC competence. The relationship that exists between principal e-leadership practices and teacher CMC competence could be supported by Leithwood & Jantzi's (2006) leadership theories. Leithwood & Jantzi (2006) indicated that there are direct effects and indirect effects between transformational school leadership practices and teachers' practices. The indirect effects can be realized through leaders' on teachers' motivation, capacity, and work settings. Hence, it is assumed that principals' e-leadership practices will have the indirect effects being acknowledged through leaders' on teachers' motivation, capacity, and work settings such as teachers' CMC competence.

In addition, all the three principal e-leadership practices dimensions were statistically significant and positively correlated with all the three teacher CMC competence toward using Frog VLE dimensions. These findings reflected that principals are able to influences teachers' skills, knowledge and motivation (CMC competence dimensions) toward using Frog VLE. This is supported by Kannan et al. (2012) stated that school

principals can inspire their teachers to enquire for more knowledge and skills (CMC competence dimensions). Besides, the authors added that when teachers perceive a good leadership from their principals, they seem to be actively involved in the programs that are developed by the leaders to enhance their ICT skills. As we know, principals have the ability to enhance teachers' skills and knowledge for effective ICT integration through teacher professional development (Van Niekerk, 2009). Hence, e-leaders should get teachers ready in terms of enhancing their knowledge and skills on e-teaching and learning; networking skills and knowledge; and teachers CMC competence in order to successfully implement VLE in schools (Chua & Chua, 2017a).

In conclusion, this study found that there is a statistically significant weak but positive correlation between principal e-leadership practices with teacher CMC competence among teachers in Klang district secondary schools. By referring to these findings, researcher argues that in order to enhance teacher CMC competence toward using Frog VLE, there is an urgent need to raise awareness among school principals with regard to their role as e-leaders to help teacher acquire higher level of CMC competencies in order to increase the usage of Frog VLE in Malaysian secondary schools. This is supported by the findings of this study found that principals' e-leadership practices is significantly correlated with teachers' CMC competence and Qteishat's (2014) finding indicated that e-leaders do have the ability to influence follower's perception and decisions to use the systems. Furthermore, teachers' CMC competence could help to build a positive relationship between principal and teachers and subsequently help to increase the usage of e-learning platform (Chua & Chua, 2017b).

5.3.7 Relationship between Teacher CMC Competence and Teacher Attitude toward Using Frog VLE

As discuss earlier in Chapter 2, teachers' CMC competence influence teachers' attitude toward using Frog VLE and that there is a link between teachers' ICT-related skills, knowledge, motivation and teachers' attitude toward using the ICT. According to Kandasamy & Parilah (2013) and Samuel & Zaitun (2007), the key factor in ensuring successful implementation of ICT programs in school is to upgrade the level of ICT knowledge and skills among teachers. Additionally, individuals' decision to adopt a new ICT is closely related to their skills and knowledge in order to form attitudes toward it and followed by its adoption or rejection (Roger, 2003). Hence, it is important to study teachers' perceptions of the CMC competence to understand better the potential role of CMC competence in the development of positive attitude toward using the technology.

From the Spearman's rho correlation analysis, it was found that there is statistically significant moderate strong positive correlation between teacher CMC competence and teacher attitude toward using Frog VLE. This study obtained that the components of the attitude (affective, cognitive and behavioural) are significant and positively correlated with CMC competence components (knowledge, motivation and skills). The implication of this is that the higher the teachers' CMC competence toward using the Frog VLE, the higher the level of teachers' attitude toward using the Frog VLE. As demonstrated by Berner (2003), Gilakjani & Leong (2012), Jegede (2007), Juanna Risah et al. (2005), Koszalka (2001) and Lord & Brown (2001) in their research on ICT, it shows that there is significantly correlated relationship between teachers' ICT competencies and teachers' attitude toward using the ICT.

Naturally, continuity with ICT explorations will most likely exist if there are adequate knowledge, skills and motivation toward using the ICT. This continuity will lead to a positive attitude toward using the ICT since better knowledge, skills and motivation foster confident toward using the ICT. This is further supported by Yunus (2007) stated that teachers have access to computer at home positively affect teachers' attitudes toward using ICT including increased their knowledge, confidence and motivation. This could be interpreted as continuity with ICT explorations and accessibility will lead to increase of knowledge, skills and motivation toward using the ICT and finally lead to a positive attitude toward using the ICT. Further supported by Spitzberg (2006), indicated that it is not surprising that computer use is positively related to computer-related skills whereas experience with computer predicted web use. This is because as CMC technology use increases, individual's knowledge and skills should increase as well. Hence, when the level of knowledge, skills and motivation (CMC competence) increases, the more positive the attitude of teachers toward using the ICT.

For example, Tezci (2010) explained that there is the positive correlation between teachers' experience and knowledge of ICT with computer and Internet attitudes. In addition, the author added that teachers' low levels of ICT usage might be strongly influenced by their low levels of expertise and lack of knowledge and experience about how to use and adapt themselves to the program. These findings reveal that the higher the teachers' level of knowledge and skills, the more their positive attitudes. Similarly, Koszalka (2001) stated that teachers whom actively involved in discussion group using computer-mediated communication may be an effective mechanism for promoting positive attitudes toward the use of web resources in the classroom thereby increasing the integration of such resources into teaching and learning environments.

In conclusion, this study found that there is statistically significant moderate strong positive correlation between teacher CMC competence and teacher attitude toward using Frog VLE. Based on this finding, the researcher argues that teacher CMC competence is another important factor that influence teacher attitude toward using Frog VLE rather than principal e-leadership practices. The findings of this study showed that both teacher CMC competence and principal e-leadership practices have a significant influence on teacher attitude toward using Frog VLE. By referring to this finding, the researcher argued that it is important to enhance principal e-leadership practices and teacher CMC competence in order to foster positive attitude toward using Frog VLE among the teachers. This is because principals' leadership (Liaw et al., 2007) and CMC competencies (Berner, 2003) is a critical factor to influence teachers' attitudes from the social perspectives.

5.3.8 Relationship between Principal e-Leadership Practices and School Virtual Learning Culture

Sohawon et al. (2015) address that culture impact each and every thing that happen in schools. School principal play vital role in initiating change in school culture toward technology use in school (Blau & Presser, 2013). In addition, there is a lack of attention and limited empirical studies focus on principals' roles on teachers' cultural beliefs and their impact on ICT adoption (Arokiasamy et al., 2015). Thus, it is important to look at school virtual learning culture from the perspective of teachers and how the roles of principals' e-leadership practices influence teachers' perception of school virtual learning culture.

The Spearman's rho correlation analysis showed that the data collected from 351 teachers in Klang district secondary schools showed that there is statistically significant

very weak but positive correlation between principal e-leadership practices and school virtual learning culture. The implication of this is that when principals practice a higher level of e-leadership, the more positive the teachers' perception of school virtual learning culture. As demonstrated by Anderman et al. (1991), it shows that teachers' perceptions of their principals have a direct impact on their perceptions of school culture. Anderman et al. (1991) result's indicated that leadership variables namely, promoting instructional climate, defining the mission, monitoring student progress, supervising teaching and managing curriculum was significantly related to at least one of the school culture variables. Besides, the authors indicated that teachers who perceive their principals as strong leaders will have positive perceptions of school culture.

In addition, purpose and people dimension of principal e-leadership practices were not statistically significant but positively correlated with values dimension of the school virtual learning culture. On the other hand, structure and social system dimension of principal e-leadership practices were statistically significant and positively correlated with values dimension of school virtual learning culture. In other words, teachers' perceptions on the values of Frog VLE seem to be related to some other factors rather than e-leadership purpose and people dimension. Teachers' perceptions with regard to Frog VLE that it will make a different in their daily practices and students' learning might be related to some background factors such as teachers have the opinion that it was a waste of time to utilize the Frog VLE (Kaur & Noorma, 2015); heavy workload (Kaur & Noorma, 2015); or teachers' perceived usefulness regarding the educational technologies (Lau & Woods, 2008). Further supported by Teo (2011) stated that perceived usefulness of teachers regarding the educational technologies is closely related to teachers' intention to adopt ICT rather than principals' technology leadership practices.

Besides, all the two principals' e-leadership practices dimensions were statistically significant and positively correlated with the beliefs dimension of school virtual learning culture. This implies that principals' e-leadership practices influence teachers' beliefs and perceptions with regard to the impact of Frog VLE on students, teachers and education. This result is consistent with Yuen's et al. (2003) findings which indicated that principals are believed to bear the responsibility to know the importance of teachers' perceptions on the role and impact of ICT in education. In addition, school leaders are the key factor in initiating a change in the context and culture within the schools (Fan et al., 2014; Fullan, 2003).

In conclusion, results showed that there is statistically significant very weak but positive correlation between principal e-leadership practices and school virtual learning culture. By referring to the results of this study, researcher argues that in order to enhance school virtual learning culture, there is an urgent need to raise awareness among school principals with regard to their role as e-leaders to inculcate positive school virtual learning culture within the schools in order to increase the usage of Frog VLE in Malaysian secondary schools. This is supported by the findings of this study found that principals' e-leadership practices is statistically significant and positively correlated with school virtual learning culture. Besides, according to Chua & Chua (2017a), an excellent e-leaders is very important in fostering positive e-learning culture in school. Furthermore, organization culture is one of the main barriers that may limit teachers from fully utilize technology in schools (Chai et al., 2009; Koszalka, 2001; Lackney, 2005).

5.3.9 Relationship between School Virtual Learning Culture and Teacher Attitude toward Using Frog VLE

According to Ertmer & Ottenbreit-Leftwich (2010), teachers' attitude and school culture are the key variables in the successful implementation of ICT. Furthermore, both school cultural level (Arokiasamy et al., 2015; Tezci, 2011; Tondeur et al., 2009) and teachers' attitude (Inan & Lowther, 2010; Kandasamy & Parilah, 2013; Porter & Donthu, 2006) is associated with the use of ICT. On the other hand, Hrastinski et al. (2009) stated that norms inherent in the organizational culture could influence the behavioural and cognitive (attitude dimensions) development of the peoples in the organization. Hence, it is important to study teachers' perceptions of school virtual learning culture to understand better the potential role of school virtual learning culture in the development of positive attitude toward using the technology in order to increase the usage of Frog VLE.

From the Spearman's rho correlation analysis, it was found that there is statistically significant strong and positive correlation between school virtual learning culture and teacher attitude toward using Frog VLE. In addition, all the two school virtual learning culture dimensions were statistically significant and positively correlated with the three teacher attitude toward using Frog VLE dimensions. These findings reflected that when teachers perceived that their school virtual learning culture is positive, their attitude toward using Frog VLE will become more positive as well. As demonstrated by those (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008; and Kollias's et al., 2005) on ICT use. These researches concluded that school culture influence teachers' attitude toward ICT adoption.

For instances, Ahmad Fauzi's et al. (2014) research findings showed that there is a significant relationship between teachers' perceptions of ICT school culture with teachers' attitudes toward using ICT in teaching and learning. On the other hand, Kollias's et al. (2005) findings found that new classroom culture influence teachers' acceptance of the technology and their attitude toward better planning and use. Similarly, Ertmer & Ottenbreit-Leftwich (2010) stated that teachers' belief and attitude is influenced by school culture and their beliefs can impact the use of ICT.

In conclusion, this study found that there is statistically significant strong and positive correlation between school virtual learning culture and teacher attitude toward using Frog VLE. Based on this finding, the researcher argues that school virtual learning culture is another important factor that influence teacher attitude toward using Frog VLE. The findings of this study showed that beside teacher CMC competence and principal e-leadership practices, school virtual learning culture is another important factor that has an impact on teacher attitude toward using Frog VLE. By referring to this finding, the researcher argues that it is important to enhance principal e-leadership practices, teacher CMC competence and school virtual learning culture in order to foster positive attitude toward using Frog VLE among teachers. This is because principals' leadership practices (Liaw et al., 2007), teachers' CMC competencies in terms of motivation, knowledge and skills (Berner, 2003) and school virtual learning culture (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008) are the critical factors that will influence teachers' attitudes toward using educational technologies.

5.3.10 The mediating effect of teachers' CMC competence on the relationship between principals e-leadership with teachers' attitudes toward using the Frog VLE

As described in the previous section of this chapter, there was a statistically significant relationship between principal e-leadership practices, teacher CMC competence and teacher attitude toward using Frog VLE. These revealed that principal e-leadership practices may directly influence teacher attitude toward using Frog VLE or indirectly through teacher CMC competence. Hence, teacher CMC competence is proposed as a mediator of the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE in this study.

The mediation analysis supported that there is a significant and positive full mediating effect of teachers' CMC competence on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Research studies showed that there is a link between teachers' ICT competencies and teachers' attitude toward using ICT (Koszalka, 2001; Spitzberg, 2007; Tezci, 2010; Yunus, 2007). Furthermore, many have confirmed the positive impact of teacher CMC competence on teachers' attitude toward using ICT (Berner, 2003; Gilakjani & Leong, 2012; Jegede, 2007; Juanna Risah et al., 2005; Koszalka, 2001; Lord & Brown, 2001) and Sherblom et al. (2013) confirmed that CMC skills, CMC knowledge and CMC motivation are significant predictor of attitude. The findings emerged from this study have numerous contributions to the body of research and proved that teacher CMC competence does influence teachers' attitude toward using Frog VLE. According to Chua & Chua (2017a), an e-leader can impact the CMC competence of a teacher. On the other hand, both Berner (2003) and Gilakjani & Leong (2012) stated that teachers' CMC competence is linked to teachers' attitude toward using ICT. Further supported by

House & Mitchell (1971; 1975), Leithwood & Jantzi (2006), and Northouse (2013) who indicated that the impact of a principal on teachers is not direct. They have provided evidence of the indirect impact of principals can have on teachers' attitude toward using Frog VLE.

For instances, Leithwood & Jantzi (2006) indicated that there are direct effects and indirect effects between transformational school leadership practices and teachers' practices. The indirect effects can be realized through leaders' on teachers' motivation, capacity and work settings. Further supported by Northouse (2013) documented that path-goal theory suggests that if followers think they are capable or felt competent of performing their work, they will be motivated. Hence, it is proven that principals' e-leadership practices have the indirect effects being acknowledged through leaders' on teachers' capacity such as teachers' CMC competence.

In conclusion, this study revealed that there is a significant and positive full mediating effect of teachers' CMC competence on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE in Klang district secondary schools. It means the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE would only occur with the existing of teacher CMC competence. A positive CMC competence would cause the positive effect of principals' e-leadership on teachers' attitude toward using Frog VLE. Hence, through enhancing teachers' CMC competence, it is believed that it can enhance teacher positive attitude toward using Frog VLE.

5.3.11 The mediating effect of school virtual learning culture on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE

As described in the previous section of this chapter, there was a statistically significant relationship between principal e-leadership practices, school virtual learning culture and teacher attitude toward using Frog VLE. These revealed that principal e-leadership practices may directly influence teacher attitude toward using Frog VLE or indirectly through school virtual learning culture. Furthermore, according to Wang (2003), a useful diagnostic instrument to measure VLE must consider every aspect of user perceptions. Thus, by considering school virtual learning culture as a mediator of the study able to provide a thorough understanding on how teachers perceived their attitudes toward using the Frog VLE. This assumption made is further supported by Chai et al. (2009), the authors argue that culture plays as a mediating variable in the relationship between teachers cultural beliefs and technology usage. The authors mentioned that there is a need to further investigate the relationships between practicing teachers' cultural perceptions and the usage of ICT in schools for teachers to understand better the dynamics at play.

Based on the data collected from 351 teachers from 34 secondary schools in Klang district, results indicated that there is a significant and positive partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Numerous literature reviews (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Gathungu et al., 2015; Hrastinski et al., 2009; Jackson et al., 2008) link strong, positive, school e-learning culture to teachers' attitude toward using ICT. Research studies have confirmed the positive impact of e-learning culture on teachers' attitude

toward using ICT (Ahmad Fauzi et al., 2014; Ertmer & Ottenbreit-Leftwich, 2010; Hrastinski et al., 2009). The findings of this study add to the body of research, affirming that school virtual learning culture does influence teachers' attitude toward using Frog VLE. An e-leader can impact the school virtual learning culture of a school (Chua & Chua, 2017a). A positive school e-learning culture is linked to increased teachers' attitude toward using ICT (Ahmad Fauzi et al., 2014; Arokiasamy et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010; Jackson et al., 2008). The impact of a principal is not direct, but theories by House & Mitchell (1975), Leithwood & Jantzi (2006) and Northouse (2013) provide evidence of the indirect impact principals can have on teachers' attitude toward using Frog VLE. For instances, Northouse (2013) indicates "path-goal theory emphasizes the relationship between the leader's style and the characteristics of the subordinates and their work setting" (p. 137). Thus, by referring to path-goal theory, besides providing information and support necessary to obtain the desired goal, other resources such as create a positive work environment or work setting including inculcate positive school virtual learning culture for the team is also important.

In conclusion, this study revealed that there is a significant and positive partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE in Klang district secondary schools. Hence, knowing that a principal may not have a direct influence, but rather an indirect influence, enables principals to focus their limited time and energy on those indirect activities that influence teacher attitude toward using Frog VLE including enhancing school virtual learning culture.

5.3.12 The moderating effect of teachers' demographic characteristics on the relationship between principals e-leadership with teachers attitudes toward using the Frog VLE

Kusano et al. (2013) and Williams (2015) stated that gender, computer experiences, teaching experiences and age variables are some of the important predictors of end user's attitudes toward using educational technology innovations. It has been difficult to demonstrate consistent results with regard to the demographic variables (gender, age, teaching experiences, and computer experiences) as antecedents to teachers' attitude toward using ICT in school. Furthermore, the amount of research on the proposed moderators (gender, age, teaching experiences and computer experiences) on the relationship between principals' leadership practices and teachers' attitude has been rather limited. Hence, it is important to examine the moderating effect of gender, age, teaching experiences and computer experiences on the relationship between principals' e-leadership practices and teachers' attitude toward using Frog VLE.

The moderating effect analysis revealed that demographic variables such as gender, age, computer experience and teaching experience are not statistically significant moderators on the relationship between principal e-leadership practices and teachers' attitudes toward using the Frog VLE in Klang district secondary schools. This reflected that teachers' perception about whether their principals are able to demonstrate e-leadership practices to inculcate positive attitudes toward using the Frog VLE among the teachers are not affected by their demographic characteristics such as gender, age, computer experiences and teaching experiences.

This is supported by Leong's et al. (2016) findings stated that teachers' gender and computer experience are not the moderators on the relationship between principal

technology leadership practices and teacher acceptance and use of school management system. Furthermore, Shouppe (2005) stated that there is no statistically significant difference between teachers' gender and teachers' perceptions of principals' leadership. However, both Leong et al. (2016) and Shouppe (2005) findings indicated that there is statistically significant difference between teachers' perceptions of principals' leadership with teachers' years of teaching experience. In addition, several literature indicated that there is statistically significant difference between teachers' perceptions of principals' leadership with their teaching experiences (Chang et al., 2008; Orr, 1990; Tahir et al., 2010) and gender (Orr, 1990; Tahir et al., 2010; Wanlabeh, 2011) which showed contradicting findings from this study.

In addition, age also found not to be a statistically significant moderator on the relationship between principal e-leadership practices and with teachers attitudes toward using the Frog VLE in Klang district secondary schools. This implied that teachers' perception about whether their principals are able to demonstrate e-leadership practices to inculcate positive attitudes toward using the Frog VLE among the teachers are not affected by their age. In simple words, younger and more senior teachers tend to have same perceptions about whether their principals are able to demonstrate e-leadership practices to inculcate positive attitudes toward using the Frog VLE among them. This is in line with Leong's et al. (2016) results indicated that age is not the moderators on the relationship between principal technology leadership practices and teacher acceptance and use of school management system. However, it contradicts with those of Chang et al. (2008), Orr (1990), Tahir et al. (2010) and Wanlabeh (2011) findings where there is a statistically significant difference between teachers' perceptions of principals' leadership with their age.

In conclusion, based on the results, it shows that gender, age, computer experiences and teaching experiences are not the significant moderators which moderating the relationship between principals' e-leadership practices and teachers' attitudes toward using the Frog VLE.

5.4 Summary of the Findings

The findings of this study indicated that teachers in Klang district, Selangor secondary schools showed medium level of attitude and medium level of CMC competence toward using Frog VLE. Besides, results indicated that teachers perceived that their principals demonstrated medium level of e-leadership practices in Klang district secondary schools and they perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE.

In addition, this study confirmed that there is statistically significant weak but positive correlation between principal e-leadership practices and teacher attitude toward using Frog VLE; there is statistically significant weak but positive correlation between principal e-leadership practices and teacher CMC competence toward using Frog VLE; there is statistically significant moderate strong positive correlation between teacher CMC competence and teacher attitude toward using Frog VLE; there is statistically significant very weak but positive correlation between principal e-leadership practices and school virtual learning culture; and affirming that there is statistically significant strong and positive correlation between school virtual learning culture and teacher attitude toward using Frog VLE.

The mediation analysis found that there is a significant and positive full mediating effect of teacher CMC competence on the relationship between principal e-leadership

practices and teacher attitude toward using Frog VLE whereas there is a significant and positive partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Finally, results indicated that teachers' demographic variables such as gender, age, computer experiences and teaching experiences were not found to be statistically significant as moderators in the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE.

5.5 Conclusion

In conclusion, it has been difficult to demonstrate consistent findings with regard to the main variables (principals' e-leadership practices, teachers' attitude, teachers computer-mediated communication competence, school virtual learning culture, and demographic variables) considered in this study. In addition, the data collected for this study are unique to the culture, context and teachers in Klang district secondary schools at the time of data collection. It is thus important to consider the methodologies and background of the study while making a comparison of the research findings or drawing conclusions from the research findings of this study. Implications, contributions, suggestions and recommendations for future study will be discussed in details in the following chapter, Chapter 6 and conclusions are made.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter describes and discusses the implications of the study, including theoretically and practically, in the fields of teacher attitude toward using Frog VLE, principal e-leadership practices, teacher CMC competence and school virtual learning culture particularly the relationship among these four variables. Next, the contributions of the findings drawn from this study to the body of knowledge are presented. Finally, recommendations for further research are addressed before conclusions are made.

6.2 Implications and Contributions

Both implications for theory and implications for the practice of the study will be discussed and presented in the section below. Particularly, on the relationship among the four main variables of this study, namely, principal e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE.

6.2.1 Implications for Theory

This study further specifies the discussion regarding principals' e-leadership practices, teachers' CMC competence, school virtual learning culture and teachers' attitude toward using Frog VLE. Numerous literature reviews developed the linkages between principals' leadership with teachers' attitude (Adegbesan, 2013; Kursunoglu & Tanrıogen, 2009; Ling & Mohammed Sani, 2013; Ottestad, 2013); school cultures (Blau & Presser, 2013; Fullan, 2003; Sohawon et al., 2015; Yuen et al., 2003) and teachers' ICT competencies (Koszalka, 2001; Spitzberg, 2007; Tezci, 2010; Yunus, 2007) but none have looked at the linkages as outlined by the framework developed for

this study. This study trying to explore other antecedents that might influences teachers' attitude toward using Frog VLE. As Venkatesh et al. (2007) documented that "study of key antecedents and various interventions are key indicators of scientific progress and practical applicability of technology adoption research as it deepens our understanding of the phenomenon and provides levers for managerial action" (p. 270). Therefore, this contribution is in line with the suggestions of Venkatesh et al. (2007) and this study could be considered as a new intervention which principals' e-leadership practices, teachers' CMC competence and school virtual learning culture are proposed as a new antecedent to teachers' attitudes toward using Frog VLE.

In addition, this study applied the tripartite model of attitudes as its primary theoretical understanding on teachers' attitude toward using Frog VLE in Klang district secondary schools with the justification that tripartite model showed highest predictive ability to explain end-users attitude due to the limited scope of the instrument (Florin et al., 2007). Based on the tripartite model of attitudes, this study was able to provide useful information on teachers' attitude toward using Frog VLE in Klang district secondary school teachers. In addition, it is useful for future researchers who are seeking directions to further examine the antecedent of teachers' attitudes toward any new educational technologies based on the tripartite model of attitudes.

Furthermore, in order for e-leadership to positively influencing teacher attitude toward using Frog VLE, the results show that principals' e-leadership practices influencing teacher attitude toward using Frog VLE through the mediated effects of teachers' CMC competence and school virtual learning culture. This means that principal e-leadership practices influence teacher attitude toward using Frog VLE through teachers' CMC competence and school virtual learning culture. The impact of a

principal on teachers attitude is not direct, it is predicted by House & Mitchell (1975), Leithwood & Jantzi (2006), and Northouse (2013) theory of leadership. These theories provide evidence of the indirect impact of principals can have on teachers' attitude toward using Frog VLE. Generally, the establishment of an empirical based framework by investigating both human and contextual factors which included principal e-leadership practices, teacher CMC competence and school virtual learning culture on teacher attitude toward using Frog VLE were the main theoretical implication of this study. The theoretical framework of this study is verified as the findings showed relatively high consistency with the existing theories and model.

6.2.2 Implications for Practice

This study provides implications to Ministry of Education (MOE) Malaysia, the Frog VLE content and service providers, school principals and practitioners including teachers, students and parents.

Firstly, this study will benefit the MOE as large amount of money has been invested in the implementation of Frog VLE. Further supported by Ministry of Finance (2014) indicated that for the purpose to increase the usage of Frog VLE among teachers, students and parent, the government has spent a total of RM513.31 million for the license and maintenance of Frog VLE for only 2 years and 6 months. Results indicated that the level of principals' e-leadership, teachers' CMC competence, school virtual learning culture and teachers' attitude toward using Frog VLE showed a medium level of mean. This may affect teachers' willingness to fully utilize Frog VLE in school and may affect the successful implementation of Frog VLE and the vision to increase the usage of Frog VLE among teachers, students and parent. Therefore, this study able to provide empirical evidence for the policy maker to enhance the level of principals' e-

leadership, teachers' CMC competence, school virtual learning culture and teachers' attitude toward using Frog VLE.

Secondly, by having a model to assess teachers' attitudes, stakeholders are in a superior position to comprehend and create fitting strategies and policies to both maintain and increase the level of teachers' attitudes toward using Frog VLE. Besides, based on the data collected on the relationship between principals' e-leadership, teachers' CMC competence, school virtual learning culture and teachers' attitudes toward using the Frog VLE, district or school administrators, and VLE content and service providers are able to plan and deliver interventions needed to assist individuals or groups of teachers in implementing Frog VLE.

As we know, the arrival of ICT has affected the roles and responsibilities of school principals in huge ways where the role of the principal has changed from solely a school manager to the current multi-faceted role of e-leader. School leaders will probably require new skills, abilities and leadership styles which are different from those required in the face-to-face communication environment (George & Sleeth, 2000). Hence, one of the most important tasks of a school principal is to figure out how to become a good e-leader. This is how the principal can act as a role model and guide teachers to improve their CMC competence in terms of motivation, skills and knowledge toward using Frog VLE. Principals need to motivate teachers as well as foster positive school virtual learning culture in order to inculcate positive attitude toward using the Frog VLE among teachers.

Thirdly, this study acts as a reference for school principals regarding administrative management through virtual learning environment. One important thing for principals to

remember is that while they are carrying out e-leadership practices, they should not focus only on technology but also the end-users attitude and school virtual learning culture. In essence, this study helps to develop and extend the knowledge in the field of e-leadership in Malaysia education context. School principals will be provided with new paradigms to improve the attitudes of teachers toward using the Frog VLE through this study. By knowing that a principal may not have a direct influence, but rather an indirect influence, enables principals to focus their limited time and energy on those indirect activities that influence teacher attitude toward using Frog VLE.

Lastly, results of this study enable school leaders to have a more thorough understanding regarding the importance of the e-leadership role that a school principal should play in the 21st century world of education. Thus, principals as e-leaders must be able to provide clear vision; able to provide attainable goal; able to provide support; able to keep students learning as centre of decision making; able to provide support in terms of pedagogic use of Frog VLE; able to create a fixed schedule for responding to teachers messages through Frog VLE; able to respond at least one times per day to teachers messages through Frog VLE; able to allocate funds to let Frog VLE-capable teachers spend time coaching their colleague; able to provide resources to support teachers' professional development; able to provide access to up-to-date information through Frog VLE; able to allow the use of Frog VLE in meetings; and able to allow Frog VLE to attend presentations in real time without having to meet face to face. This eventually helps them to develop the skills needed and at the same time raise awareness among school leaders to fully utilize and increase the use of Frog VLE provided by the government. At the mean time, leadership training programs need to carefully consider how to best fulfill these e-leadership standards in a virtual setting as outlined from the findings of this study.

In addition, this study will also provide information for MOE to look at the antecedent factors that influence teachers' attitude toward using Frog VLE and manage and conduct suitable training programs for pre-service teachers. These have implications for designing training programs especially shed light on the individual (such as teachers' CMC competence and teachers' attitude) and contextual (such as principals' e-leadership practices and school virtual learning culture) factors. As we know, in order to enable a person to have a better preparation to use the system, identification of one's own weaknesses is important.

On the other hand, the findings of this study revealed that teachers in Klang district secondary schools showed a medium level of CMC competence toward using Frog VLE. This study proved that teacher CMC competence is associated with teacher attitude toward using Frog VLE. Kaur & Noorma (2015) indicated that the Frog VLE courses that the teachers attended are not sufficient to give an impact on teachers' skills in accessing Frog VLE. This reflected that Frog VLE-related training play a vital role in developing teachers' CMC competence and able to influence teachers' attitude toward using Frog VLE. Hence, adequate and sufficient training is very important in ensuring teacher positive attitude toward using Frog VLE.

6.3 Contributions

This current study has numerous contributions to the body of knowledge. Firstly, this study has shed light to the implementation of e-learning platform and specifically Frog VLE and added value to further enhance teacher attitude toward using Frog VLE in school. Secondly, since it is important to have a consistent standard in terms of principal e-leadership practices and teacher CMC competence dimensions which are in line with the aims of Malaysian school, the findings that emerged from this study act as a

guideline for policy maker to consider the significance determinants of principal e-leadership practices and teacher CMC competence.

Thirdly, two factors that fully or partially mediated the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE were found. Two significant factors of the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE are depicted in Figure 6.1.

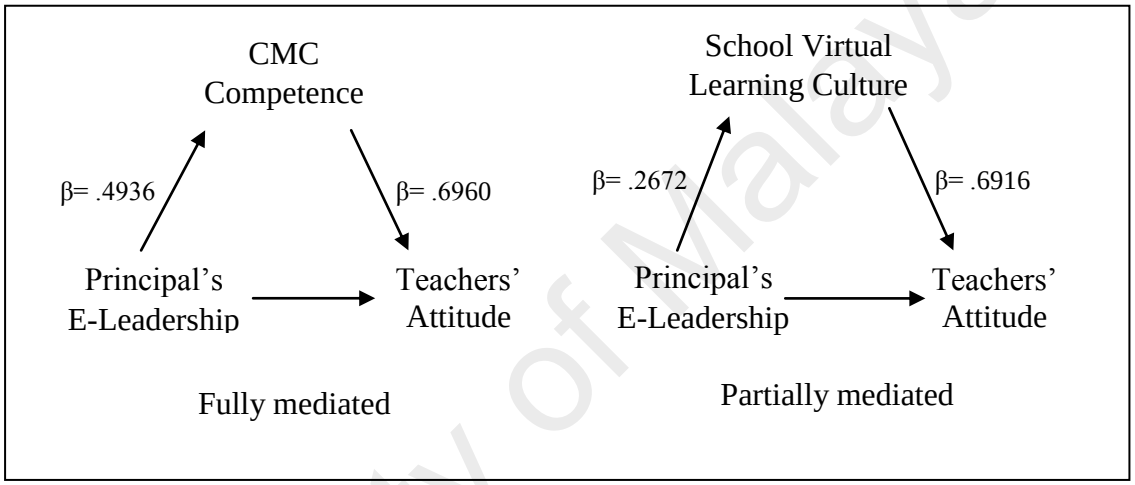

Figure 6.1: Significant Factors of the Relationship between Principal E-Leadership Practices and Teacher Attitude toward Using Frog VLE

These findings contributed to the body of knowledge in the field of e-leadership and serve as a reference for future studies. In addition, this study has enriched the e-leadership literature to some extent in the field of educational management and leadership by combining the theoretical approaches of the influence of leadership factors with teacher attitude toward using educational technologies. Both transformational and path-goal leadership theories have sparked the mediation model that have been established in this study.

Lastly, this study has developed a new research instrument that incorporates principal e-leadership practices, teacher CMC competence, school virtual learning

culture and teacher attitude toward using Frog VLE as the four main variables. This developed instrument was analyzed and tested with SEM and has achieved a good degree of reliability and validity. Hence, this instrument is an added value to future researchers who are seeking directions to further examine the relationship that exists between these variables. Besides, implementation of Frog VLE is very recent in Malaysia and there is not enough systematic research to understand teachers' attitudes toward this innovation. This questionnaire may enable such research.

6.4 Suggestions

By referring to the findings and discussion presented in the previous section, there are few suggestions suggested by the researchers in order to enhance teachers' attitude toward using educational technologies. Firstly, MOE should ensure that every end-user have access to the educational technology by providing adequate facilities to the school before the project start. On the other hand, Institute Aminuddin Baki (The National Institute of Educational Management and Leadership) under the flagship of MOE should provide necessary training to the principals in the area of e-leadership through their short-term in-service courses or even their long-term diploma courses such as the National Professional Qualification for Educational Leaders (NPQEL). This leadership training is hoped to create greater awareness among the principals of the importance in adhering to the principal e-leadership practices to meet the requirements to become a high performing leaders to improve the quality of the school.

In addition, school principals should be aware of their role as e-leaders in enhancing teacher CMC competence and teacher attitude toward using educational technologies and acquire necessary e-leaders' knowledge and skills. Schools principals should also be proactive with regard to collect information or data regarding teachers CMC

competencies level. This will help them to be certain in designing effective ICT training programs that are more focused on the needs of teachers. On the other hand, teachers should have awareness of their own skills and knowledge toward using educational technologies and exploring their own opportunities to enhance their competencies toward using educational technologies regularly.

6.5 Recommendations for Future Research

Based on the limitation of this study, few recommendations are presented for future consideration. Besides, attention should be given to improve the quality of the future research in the same field.

Firstly, the self-administered questionnaire is the only research instrument for the researcher to review the data comprehensively. Therefore, feedback received from the respondents is dependent on the sincerity and honesty of the respondents in answering the questionnaire that might affect the research findings. Furthermore, researcher adapted the instrument from various sources through literature review and this is the first time an attempt is made to examine the relationship between and among the dependent and independent variables defined in this study in the contexts of Klang district secondary school. Therefore, instrumentation bias is one of the limitations of this study. Thus, it is recommended that future research should include other techniques of data collection such as interviews and direct observation for the purpose of cross validation on the responses given.

In addition, there is relatively limited current literature on e-leadership, CMC competence, school virtual learning culture and teachers' attitude that relied on qualitative method. Hence, a methodological shift from quantitative method to the

qualitative method would provide researchers with new insights in order to gain a richer understanding of these variables.

Another limitation of this research is that the survey was cross-sectional in nature and collected from Klang district secondary schools only at a single point in time. As such, there is potential for the confounding effects of any other factors outside the variables under investigation to distort the results. Additionally, individual's perception regarding the Frog VLE may change over time when they gain experience on its usage. Hence, it is recommended that future studies should utilize a longitudinal research design.

Besides that, this study integrated three factors, namely, principal e-leadership practices, teacher CMC competence and school virtual learning culture as the predictors on teacher attitude toward using Frog VLE is a relatively new research area in Malaysia. Hence, the findings and results of this study can only be used and interpreted with caution and the results obtained from this study have to be further tested and verified with more studies of this nature. Subject taught by the teachers is not included as one of the moderating variables in this study. As different subject teachers may possess different attitude toward using Frog VLE, future study are recommended to include subject taught by teachers as one of the moderating variables while investigating teachers' attitudes toward using ICT.

In addition, the findings of this study are limited to the characteristics of the samples from Klang district secondary schools and the virtual learning platform known as Frog VLE. Hence, further research in e-leadership practices, teachers' CMC competence,

school virtual learning culture and teachers' attitudes are recommended to be conducted in other locations to provide clearer pictures of the relationship between these variables.

Future research related to Frog VLE usage is recommended to examine from the perspective of principals. This is because principals play a significantly important role in ensuring successful integration of ICT within the school (Gronow, 2007). In order to ensure the field of e-leadership continues to mature, the researcher proposes that significantly more research should be carried out in this field. Future studies should seek to identify how the characteristics of effective e-leaders may be achieved and more empirical-based data is needed in order to align the practice-based indicators with more overarching theoretical concepts. In order to ensure that leaders at all levels learn about e-leadership in educational technologies, considerably more attention is needed on research and development in e-leadership and the related fields of educational technologies.

6.6 Conclusion

The usages of Frog VLE in all Malaysian schools are under tremendous pressure to improve. Principals' e-leadership, teachers' CMC competence, school virtual learning culture and teachers' attitude toward using Frog VLE is a research avenue which must be extensively explored with the anticipation that the findings will confirm or expand existing knowledge. A more thorough understanding of these factors can enhance existing practices and thus improve teachers' attitude toward using Frog VLE.

The findings of this study indicated that teachers in Klang district, Selangor secondary schools showed medium level of attitude and medium level of CMC competence toward using Frog VLE. Besides, results indicated that teachers perceived

that their principals demonstrated medium level of e-leadership practices and perceived that their school demonstrated medium level of school virtual learning culture toward using Frog VLE.

In addition, this study confirmed that there is a statistically significant positive correlation between principal e-leadership practices, teacher CMC competence, school virtual learning culture and teacher attitude toward using Frog VLE. The mediation analysis found that there is a significant and positive full mediating effect of teacher CMC competence and significant and positive partial mediating effect of school virtual learning culture on the relationship between principal e-leadership practices and teacher attitude toward using Frog VLE. Finally, results indicated that teacher demographic characteristics such as gender, age, computer experiences and teaching experiences are not the moderators which moderating the relationship between principal e-leadership practices and teachers' attitudes toward using the Frog VLE.

This study has shed light on the new antecedents of teachers' attitudes toward using Frog VLE from the perspective of individual factors such as teachers' CMC competence and contextual factors such as principals' e-leadership practices and school virtual learning culture. Furthermore, this current study has numerous implications and contributions to the body of knowledge on technology integration and pedagogical innovations. It is hoped that through this study, the findings could be compared and contrasted with similar studies in other regions and countries. The mediation model established from this study could be further tested and verified through longitudinal research within clearly defined contexts of any education institutions including primary, secondary and tertiary education institutions.

REFERENCES

Aarons, G. A. (2006). Transformational and transactional leadership: Association with attitudes toward evidence-based practice. *Psychiatric Services, 57*(8), 1162–1169.

Adegbesan, S. O. (2013). Effect of principals' leadership style on teachers' attitude to work in Ogun state secondary schools, Nigeria. *Turkish Online Journal of Distance Education, 14*(1), 14–28.

Adeyemi, T. O., & Olaleye, F. O. (2010). Information communication and technology (ICT) for the effective management of secondary schools for sustainable development in Ekiti State, Nigeria. *American-Eurasian Journal of Scientific Research*, *5*(2), 106–113.

Adu, E. O., & Olatundun, S. A. (2013). The use and management of ICT in schools: Strategies for school leaders. *European Journal of Computer Science and Information Technology (EJCSIT)*, *1*(2), 10–16.

Ahmad Fauzi, M. A., Kamariah, A. B., & Rohayati, I. (2014). Factors predicting teachers' attitudes towards the use of ICT in teaching and learning. In *AIP Conference Proceedings* (Vol. 1682, p. 030010). Selangor, Malaysia: AIP Publishing. https://doi.org/10.1063/1.4932473

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action control: From cognition to behaviour* (pp. 11–39). New York: Springer Verlag.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. N.J: Englewood Cliffs, N.J : Prentice-Hall.

Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education, 47*(4), 373–398. https://doi.org/10.1016/j.compedu.2004.10.013

Al-Gahtani, S. S. (2011). Modeling the electronic transactions acceptance using an extended technology acceptance model. *Applied Computing and Informatics, 9*(1), 47–77. https://doi.org/10.1016/j.aci.2009.04.001

Al-Zaidiyeen, N. J., Leong, L. M., & Fong, S. F. (2010). Teachers' attitudes and levels of technology use in classrooms: The case of Jordan schools. *International Education Studies*, *3*(2), 211-218.

Ana Haziqah, A. R. (2014). *Teachers' perception towards virtual learning environment.* (Unpublished Masters Thesis). Universiti Teknologi Malaysia, Malaysia.

Anderman, E. M., Belzer, S., & Smith, J. (1991). *Teacher commitment and job satisfaction: The role of school culture and principal leadership.* (Annual Meeting of the American Educational Research Association). Chicago, IL: National Center for School Leadership. Retrieved from http://eric.ed.gov/?id=ED375497

Arokiasamy, A. R. A., Abdul Ghani Kanesan, A., & Aziah, I. (2014). Correlation between cultural perceptions, leadership style and ICT usage by school principals in Malaysia. *TOJET: The Turkish Online Journal of Educational Technology*, *13*(3), 27–40.

Arokiasamy, A. R. A., Abdul Ghani Kanesan, A., & Aziah, I. (2015). Correlation between Cultural Perceptions, Leadership Style and ICT Usage by School Principals in Malaysia. *Procedia - Social and Behavioural Sciences*, *176*, 319–332. https://doi.org/10.1016/j.sbspro.2015.01.478

Arumugam, R., & Abdul Halim, M. (2013). Issues of ICT usage among Malaysian secondary school english teachers. *English Language Teaching*, *6*(9), 74–82. https://doi.org/10.5539/elt.v6n9p74

ASLI-CPPS, PROHAM, & KITA-UKM. (2012). *Report on education reform and process of consultation*. Retrieved from http://www.cpps.org.my/upload/EDUCATION%20REFORM%20IN%20MALAYSIA%20REPORT%202012.pdf

Avolio, B. J., Kahai, S., & Dodge, G. E. (2000). E-leadership: Implications for theory, research, and practice. *The Leadership Quarterly*, *11*(4), 615–668.

Avolio, B. J., & Kahai, S. S. (2003). Adding the "e" to e-leadership: How it may impact your leadership. *Organizational Dynamics*, *31*(4), 325–338.

Avolio, B. J., Sosik, J. J., Kahai, S. S., & Baker, B. (2014). E-leadership: Re-examining transformations in leadership source and transmission. *The Leadership Quarterly*, *25*(1), 105–131. https://doi.org/10.1016/j.leaqua.2013.11.003

Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, *60*(1), 421–449. https://doi.org/10.1146/annurev.psych.60.110707.163621

Bagozzi, R. P., Tybout, A. M., Craig, C. S., & Sternthal, B. (1979). The construct validity of the tripartite classification of attitudes. *Journal of Marketing Research*, *16*(1), 88–95. https://doi.org/10.2307/3150879

Bakic-Tomic, L., Dvorski, J., & Kirinic, A. (2015). Elements of teacher communication competence: An examination of skills and knowledge to communicate. *International Journal of Research in Education and Science*, *1*(2), 157–166.

Balogun, J., & Stuart, R. (2014). *Landing transformational change* (Annual report 2014). London: CIPD.

Bandura, A. (1977). *Social learning theory*. Englewood Clifts, NJ: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory* . Englewood Cliffs, NJ: Prentice Hall, Inc.

Bandura, A. (1997). *Self efficacy: The exercise of control*. New York: W.H. Freeman.

Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology*, *3*(3), 265–299.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Bass, B. (1990). From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics*, *18*(3), 19–31.

Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? *Computers & Education*, *39*(4), 395–414.

Becker, H. J. (1999). *Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed Student Use. Teaching, Learning, and Computing: 1998 National Survey. Report# 1.* Center for Research on Information Technology and Organizations The University of California, Irvine and The University of Minnesota. Retrieved from http://eric.ed.gov/?id=ED429564

Benzie, D. (1995). IFIP Working group 3.5: Using computers to support young learners. In J. D. Tinsley & T. J. Van Weert (Eds.), *World conference on computers in education VI: WCCE 95 liberating the learner* (pp. 35–42). London: Chapman & Hall.

Berner, J. (2003). *A study of factors that may influence faculty in selected schools of education in the Commonwealth of Virginia to adopt computers in the classroom.* (Degree of Doctor in Philosophy). George Mason University, US.

Bierly, C., Doyle, B., & Smith, A. (2016). *Transforming schools: How distributed leadership can create more high-performing schools* (pp. 1–52). Bain & Company, Inc. Retrieved from https://www.researchgate.net/profile/Michael_Romanowski/publication/264336522_Problems_of_bias_in_history_textbooks/links/53d900380cf2e38c6331d686.pdf

Bingimals, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education*, *5*(3), 235–245.

Blair, N. (2012). Technology integration for the new 21st century learner. *Principal*, *91*(3), 8–13.

Blau, I., & Presser, O. (2013). E-Leadership of school principals: Increasing school effectiveness by a school data management system: E-Leadership by school principals. *British Journal of Educational Technology*, *44*(6), 1000–1011. https://doi.org/10.1111/bjet.12088

British Educational Communications and Technology Agency (Becta). (2003). Primary schools – ICT and standards. Retrieved from http://dera.ioe.ac.uk/1700/1/becta_2002_ictstandards_analysisreport.pdf.

British Educational Communications and Technology Agency (Becta). (2004). *A review of the research literature on barriers to the uptake of ICT by teachers.* Retrieved from http://dera.ioe.ac.uk/1603/1/becta_2004_barrierstouptake_litrev.pdf

Brown, A. (1967). Reactions to Leadership. *Education Administration Quarterly*, *3*(1), 62–73.

Bryne, B. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). New York: Routledge, Taylor and Francis Group.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development Using Information and Communication Technology*, *8*(1), 136-155.

Bubaš, G. (2001). Computer mediated communication theories and phenomena: Factors that influence collaboration over the Internet. Presented at the 3rd CARNet Users Conference, Zagreb, Hungary.

Bubaš, G. (2006). Competence in computer-mediated communication: An evaluation and potential uses of a self-assessment measure. Presented at the International Communication Association Conference, Dresden, Germany.

Bullock, D. (2004). Moving from theory to practice: An examination of the factors that preservice teachers encounter as the attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education*, *12*(2), 211–237.

Bush, T. (2011). *Theories of educational leadership and management* (Forth ed). London: Sage.

Cakir, T. (2014). The attitudes of preschool teachers and principals towards computer using. *Anthropologist*, *18*(3), 735–744.

Carreño, I.D.V.G. (2009). E-mentoring and e-leadership importance in the quality of distance and virtual education Century XXI. In A. Méndez Vilas, A. Solano Martín, J. Mesa González, & J. A. Mesa González (Eds.), *Research, Reflections and Innovations in Integrating ICT in Education* (Vol. 2, pp. 728–732). Badajoz, Spain: Formatex.

Cascio, W. F., & Shurygailo, S. (2003). E-leadership and virtual teams. *Organizational Dynamics*, *31*(4), 362–376.

Castells, M. (2010). *The rise of the network society* (Second ed). West Sussex, United Kingdom: Wiley-Blackwell.

Cavas, B., Cavas, P., Karaoglan, B., & Kisla, T. (2009). A study on science teachers' attitudes toward information and communication technologies in education. *TOJET: The Turkish Online Journal of Educational Technology*, *8*(2), 20–32.

Celep, C., & Tülübaş, T. (2014). Effect of principals' technological leadership on teachers' attitude towards the use of educational technologies. In D. Passey & A. Tatnall (Eds.), *Key competencies in ICT and informatics. implications and issues for educational professionals and management* (Vol. 444, pp. 247–258). Berlin, Heidelberg: Springer Berlin Heidelberg.

Chai, C. S., Hong, H.-Y., & Teo, T. K. G. (2009). Singaporean and Taiwanese pre-service teachers' beliefs and their attitude towards ICT use: A comparative study. *The Asia-Pacific Education Researcher*, *18*(1), 117–128.

Chandra, V., & Mills, K. A. (2015). Transforming the core business of teaching and learning in classrooms through ICT. *Technology, Pedagogy and Education*, *24*(3), 285–301. https://doi.org/10.1080/1475939X.2014.975737

Chang, I.-H. (2012). The effect of principals' technological leadership on teachers' technological literacy and teaching effectiveness in Taiwanese elementary schools. *Educational Technology & Society*, *15*(2), 328–340.

Chang, I.-H., Chin, J. M., & Hsu, C.-M. (2008). Teachers' perceptions of the dimensions and implementation of technology leadership of principals in Taiwanese elementary schools. *Educational Technology & Society*, *11*(4), 229–245.

Cheng, Y. C. (1994). Principal's leadership as a critical factor for school performance: Evidence from multi-levels of primary schools. *School Effectiveness and School Improvement*, *5*(3), 299–317. https://doi.org/10.1080/0924345940050306

Cheok, M. L., & Wong, S. L. (2014). Predictors of e-learning satisfaction among the Malaysian secondary school teachers. In *Proceedings of the 22nd International Conference on Computers in Education* (pp. 33–40). Japan: Asia-Pacific Society for Computers in Education.

Ching, S. K. (2014). *Usage of frog virtual learning environment (VLE) towards science achievement among the secondary school students* (Sarjana Pendidikan (Teknologi Pengajaran)). Universiti Utara Malaysia, Malaysia.

Christensen, R. (1997). *Effect of Technology Integration Education on the Attitude of Teachers and Their Students* (Degree of Doctor in Philosophy). University of North Texas, Denton, Texas.

Christensen, R. (2002). Effect of technology integartion education on the attitudes of teachers and students. *Journal of Research on Technology in Education*, *34*(4), 411–433.

Chua, Y.P., & Chua, Y.P. (2017). Do computer-mediated communication skill, knowledge and motivation mediate the relationships between personality traits and attitude toward Facebook? *Computers in Human Behaviour*, *70*, 51–59. https://doi.org/10.1016/j.chb.2016.12.034

Chua, Y.P. (2012). *Mastering research methods.* Malaysia: McGraw-Hill Education.

Chua, Y.P. (2013). *Mastering research statistics*. Malaysia: McGraw-Hill Education.

Chua, Y.P, & Chua, Y.P. (2017a). How are e-leadership practices in implementing a school virtual learning environment enhanced? A grounded model study. *Computers & Education. 109*(C), 109–121.

Chua, Y.P, & Chua, Y.P. (2017b). Developing a grounded model for educational technology leadership practices. *Education and Science*, *42*(189), 73–84.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education.* (7th ed.). New York: Routledge.

Colin, L., & Donald, E. H. (2003). *Leadership for 21st century learning: Global perspectives from educational innovators.* London: Kogan Page Limited.

Cox, M., Preston, C., & Cox, K. (2000). What factors support or prevent teachers from using ICT in their classrooms? Presented at the British Educational Research Association Annual Conference, University of Sussex, Brighton.

Creswell, J. W. (2014). *Educational research: Planning, conducting, and evaluating quantitative* (4th ed.). England: Pearson Education Limited.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: explaining an apparent paradox. *American Educational Research Journal*, *38*(4), 813–834. https://doi.org/10.3102/00028312038004813

Dale, .R., & Robertson, S. L. (2003). Editorial. Introduction. *Globalisation, Societies and Education, 1*(1), 3–11.

Dalege, J., Borsboom, D., van Harreveld, F., van den Berg, H., Conner, M., & van der Maas, H. L. (2016). Toward a formalized account of attitudes: The Causal Attitude Network (CAN) model. *Psychological Review*, *123*(1), 2–22.

DasGupta, P. (2011). Literature review: E-leadership. *Emerging Leadership Journeys*, *4*(1), 1–36.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behaviour to identify key beliefs underlying pro-environmental behaviour in high-school students: Implications for educational interventions. *Journal of Environmental Psychology*, *42*, 128–138. https://doi.org/10.1016/j.jenvp.2015.03.005

Demetriadis, S., Barbas, A., Molohides, A., Palaigeorgiou, G., Psillos, D., Vlahavas, I., … Pombortsis, A. (2003). "Cultures in negotiation": Teachers' acceptance/resistance attitudes considering the infusion of technology into schools. *Computers & Education*, *41*(1), 19–37. https://doi.org/10.1016/S0360-1315(03)00012-5

Demirci, A. (2009). How do teachers approach new technologies: Geography teachers' attitudes towards geographic information systems (GIS). *European Journal of Educational Studies*, *1*(1), 43–53.

Dimmock, C., & Lam, M. (2000). *Research methods in educational leadership and management*. London: Sage.

Doherty, L. (2005). Where worlds collide and pupils leave teachers behind. *Sydney Morning Herald*. Retrieved from http://www.smh.com.au/news/national/where-worlds-collide-and-pupils-leave-teachers-behind/2005/09/30/1127804662694.html

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, *51*(1), 187–199. https://doi.org/10.1016/j.compedu.2007.05.001

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423–435. https://doi.org/10.1016/j.compedu.2012.02.001

Fan, K.T. (2013). Investigating the perceived of e-leadership style change and its consequence in virtual context. Paper presented at the Proceedings of the 2013 International Conference on Technology Innovation and Industrial Management, Phuket, Thailand, 29-31 May (pp. 298–318). Thailand: ToKnowPress.

Fan, K.T., Chen, Y.H., Wang, C.W., & Chen, M. (2014). E-leadership effectiveness in virtual teams: Motivating language perspective. *Industrial Management & Data Systems*, *114*(3), 421–437. https://doi.org/10.1108/IMDS-07-2013-0294

Fishbein, M., & Ajzen, I. (1975). *Belief, attitudes, intention, and behaviour. An introduction to theory and research.* Massachussets: Addison-Wesley.

Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, *41*(2), 124–142. https://doi.org/10.1108/09578230310464648

Florin, J., Karri, R., & Rossiter, N. (2007). Fostering entrepreneurial drive in business education: An attitudinal approach. *Journal of Management Education*, *31*(1), 17–42. https://doi.org/10.1177/1052562905282023

Fong, S. F., Ch'ng, P. E., & Por, F. P. (2013). Development of ICT Competency Standard Using the Delphi Technique. *Procedia - Social and Behavioural Sciences*, *103*, 299–314. https://doi.org/10.1016/j.sbspro.2013.10.338

Fraenkel, J., Wallen, N., & Hyun, H. (2012). *How to Design and Evaluate Research in Education* (8th ed.). New York: McGraw-Hill.

Fullan, M. (2007). *The new meaning of educational change* (4th ed.). New York: Teachers College press.

Fullan, M. (2003). *The moral imperative of school leaderhip*. Thousand Oaks, California: Corwin Press, Inc.

Garson, G. (2016). *Partial Least Squares Regression and Structural Equation Models*. USA: Statistical Publishing Associates.

Gathungu, E. W., Iravo, D. M. A., & Namusonge, G. S. (2015). Transformational leadership and employee's commitment: empirical review. *IOSR Journal Of Humanities And Social Science*, *20*(7), 1–7.

Gay, L. R., & Airasian, P. (2000). *Educational research: Competencies for analysis and application* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Gay, L. R., Mills, G. E., & Airasian, P. W. (2011). *Educational research: Competencies for analysis and applications* (10th ed.). Boston: Pearson Higher Ed.

George, G., & Sleeth, R. G. (2000). Leadership in computer-mediated communication: Implications and research directions. *Journal of Business and Psychology*, *15*(2), 287–310.

Ghani, Muhammad Faizal A. (2013). *Educational management in Malaysia*. Kuala Lumpur: University of Malaya Press.

Gilakjani, A. P., & Leong, L.-M. (2012). EFL teacher's attitudes toward using computer technology in english language teaching. *Theory and Practice in Language Studies*, *2*(3), 630–636. https://doi.org/10.4304/tpls.2.3.630-636

Goos, M., & Bennison, A. (2008). Surveying the technology landscape: Teachers' use of technology in secondary mathematics classrooms. *Mathematics Education Research Journal*, *20*(3), 102–130.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *The Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco, CA: John Wiley & Sons, Inc.

Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The Internet and Higher Education*, *18*, 4–14. https://doi.org/10.1016/j.iheduc.2012.09.003

Gronow, M. (2007). *ICT leadership in school education.* Paper presented at the Australian Catholic University Conference, Sydney, Australia.

Gryzelius, J. (2015). *ICT in classroom learning: Exploring the discrepancies between ideal conditions and current Malaysian policy*. Malaysia: Institute for Democracy and Economic Affairs. Retrieved from http://ideas.org.my/wp-content/uploads/2015/02/20150226-PI18-ICT-in-Classroom-Education-FINAL.pdf

Guetterman, T. C. (2015). Descriptions of sampling practices within five approaches to qualitative research in education and the health sciences. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 16). Retrieved from http://www.qualitative-research.net/index.php/fqs/artic*le*/view/2290

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology & Society*, *11*(3), 37–51.

Gurr, D. (2004). ICT, leadership in education and e-leadership. *Discourse: Studies in the Cultural Politics of Education*, *25*(1), 113–124. https://doi.org/10.1080/0159630042000178518.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Thousand Oaks: Sage Publications.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. B. (2007). Virtual team leadership: The effects of leadership style and communication medium on team interaction styles and outcomes. *Organizational Behaviour and Human Decision Processes*, *103*(1), 1–20. https://doi.org/10.1016/j.obhdp.2006.09.004

Hamzah, M. I., Ismail, A., & Embi, M. A. (2009). The impact of technology change in Malaysian smart schools on islamic education teachers and students. *International Journal of Human and Social Sciences*, *4*(11), 824–836.

Hanna, N. K. (2007). *E-Leadership institutions for the knowledge economy.* (World Bank Institute Working Paper.). Washington, DC: World Bank. Retrieved from http://info.worldbank.org/etools/docs/library/241087/ELeadershipInstitutionsFinal.pdf

Harris, A., Jones, M., & Baba, S. (2013). Distributed leadership and digital collaborative learning: A synergistic relationship? *British Journal of Educational Technology*, *44*(6), 926–939.

Harrison, W., & Rainer, K. (1992). An examination of the factor structures and concurrent validates for the computer attitude scale, the computer anxiety rating scale, and the computer self-efficacy scale. *Educational and Psychological Measurement*, *52*, 735–744. https://doi.org/10.1177/0013164492052003024

Haughey, M. (2006). The impact of computers on the work of the principal: changing discourses on talk, leadership and professionalism. *School Leadership & Management*, *26*(1), 23–36. https://doi.org/10.1080/13634230500492897

He, R. (2008). *E-leadership strategy in virtual organizations and virtual teams* (Unpublished Master's Thesis). Helsinki University of Technology, Finland.

Heck, R. H., & Hallinger, P. (1999). Next generation methods for the study of leadership and school improvement. In J. Murphy & K. S. Louis (Eds.), *Handbook of research on educational administration : a project of the American Educational Research Association* (pp. 141–162). San Francisco: Jossey-Bass.

Herring, M. C., Koehler, M. J., & Mishra, P. (2016). *Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators* (2nd ed.). USA: Routledge.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, *55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hiong, S. N., & Umbit, A. F. (2015). A pilot study on factors affecting the use of frog virtual learning environment. *Jurnal Penyelidikan IPG KBL, 12*, 1–17.

Hollingsworth, M., & Mrazek, R. (2004). *Information technology leadership in education: An Alberta needs assessment.* (Learning and Technology Research, Stakeholder Technology Branch). Edmonton, Alberta: Australian Council for Educational Research.

House, R. J. (1971). A Path Goal Theory of Leader Effectiveness. *Administrative Science Quarterly*, *16*(3), 321–339. https://doi.org/10.2307/2391905

House, R. J., & Mitchell, T. R. (1975). *Path-goal theory of leadership* (Technical Report). Seattle: University of Washington. Retrieved from http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA009513

Hrastinski, S., Keller, C., & Lindh, J. (2009). Is e-learning used for enhancing administration or learning? On the implications of organisational culture. In M. Stansfield & T. Connolly (Eds.), *Institutional Transformation through Best Practices in Virtual Campus Development: Advancing E-Learning Policies* (Vol. 1). USA: IGI Global.

Hsieh, J. P.-A., Rai, A., & Keil, M. (2008). Understanding digital inequality: Comparing continued use behavioural models of the socio-economically advantaged and disadvantaged. *MIS Quarterly*, *32*(1), 97–126.

Huang, H.-M., & Liaw, S.-S. (2005). Exploring users' attitudes and intentions toward the web as a survey tool. *Computers in Human Behaviour*, *21*(5), 729–743. https://doi.org/10.1016/j.chb.2004.02.020

Hung, Y.-W., & Hsu, Y.-S. (2007). Examining teachers' CBT use in the classroom: A study in secondary schools in Taiwan. *Educational Technology & Society*, *10*(3), 233–246.

Husing, T., Korte, W. B., Fonstad, N., Lanvin, B., Cattaneo, G., Kolding, M., … Van Welsum, D. (2013). *E-leadership, e-skills for competitiveness and innovation vision, roadmap and foresight scenarios final report.* European Commission, DG Enterprise and Industry.

Hussien, A. (2013). *Mission of public education in Malaysia*. Kuala Lumpur: University of Malaya Press.

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in k-12 classrooms: A path model. *Educational Technology Research and Development*, *58*(2), 137–154. https://doi.org/10.1007/s11423-009-9132-y

Irfan Naufal, U., & Mohamad Tarmizi, M. M. (2014). A study on Malaysian Teachers' Level of ICT Skills and Practices, and its Impact on Teaching and Learning. *Procedia - Social and Behavioural Sciences*, *116*, 979–984. https://doi.org/10.1016/j.sbspro.2014.01.331

Jablin, F. M., & Putnam, L. L. (2001). *The new handbook of organizational communication: Advances in theory, research, and methods*. Thousand Oaks, CA: SAGE Publications.

Jackson, L. A., Zhao, Y., Qiu, W., Kolenic, A., III, Fitzgerald, H. E., Harold, R., & von Eye, A. (2008). Culture, gender and information technology use: A comparison of Chinese and US children. Comput. Hum. Behav., *24*(6), 2817–2829. https://doi.org/10.1016/j.chb.2008.04.007

Jain, V. (2014). 3D model of attitude. *International Journal of Advanced Research in Management and Social Sciences*, *3*(3), 1–12.

Jameson, J. (2013). E-Leadership in higher education: The fifth "age" of educational technology research. *British Journal of Educational Technology*, *44*(6), 889–915. https://doi.org/10.1111/bjet.12103

Jameson, J. (2014). Distributed e-leadership and trust: The visibility/invisibility paradox in the ecology of online school communities. In *International Congress for School Effectiveness and Improvement*. Yogyakarta, Indonesia.

Jegede, S. A., Dibu-Ojerinde, O.O., llori, M.O. (2007). Relationships between ICT competence and attitude among some Nigerian tertiary institution lecturers, *Educational Research and Reviews*, *2*(7), 172-175.

Jensen, B. (2012). *Catching up: Learning from the best school systems in East Asia. Summary report*. Grattan Institute. Retrieved from http://www.grattan.edu.au/publications/129_report_learning_from_the_best_main.pdf

Johnson, B., & Christensen, L. (2008). *Educational research: Quantitative, qualitative, and mixed approaches.* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Johnson, R. ., & Christensen, L. (2014). *Educational Research: Quantitative, Qualitative, and Mixed Approaches* (5th ed.). Thousand Oaks, California: Sage Publications, Inc.

Juanna Risah, S., Wong, S. L., & Samsilah, R. (2005). Attitudes and perceived information technology competency among teachers. *Malaysian Online Journal of Instructional Technology*, *2*(3), 70–77.

Kamaruddin, M. (2014). *Keberkesanan integrasi aplikasi web 2.0 dalam persekitaran pembelajaran maya (FrogVLE) terhadap pencapaian pelajar tingkatan empat bagi mata pelajaran teknologi maklumat dan komunikasi* (Sarjana Pendidikan (Teknologi Maklumat)). Universiti Pendidikan Sultan Idris, Malaysia.

Kandasamy, M., & Parilah, Hj.M.S. (2013). Knowledge, attitude and use of ICT among ESL teachers. In *Proceedings of the Global Summit on Education* (pp. 185–199). Malaysia, GSE Journal of Education.

Kannan, S., Sharma, S., & Zuraidah, A. (2012). Principal's strategies for leading ICT integration: The Malaysian perspective. *Creative Education, 3*(8), 111–115. https://doi.org/10.4236/ce.2012.38B023

Kathryn, L. A. (2003). *Local meanings, global schooling: Anthropology and world culture theory*. New York: Palgrave Macmillan.

Kaur, T., & Noorma, H. (2015). Teachers' Readiness to Utilize Frog VLE: A Case Study of a Malaysian Secondary School. *British Journal of Education, Society & Behavioural Science, 5*(1), 20–29. https://doi.org/10.9734/BJESBS/2015/11965

Kay, R. (2006). Addressing gender differences in computer ability, attitudes and use: The laptop effect. *Journal of Educational Computing Research*, *34*(2), 187–211.

Kay, R. H. (1989a). A practical and theoretical approach to assessing computer attitudes: The computer attitude measure (CAM). *Journal of Research on Computing in Education*, *21*(4), 456–463.

Kay, R. H. (1993b). An exploration of theoretical and practical foundations for assessing attitudes toward computers: The computer attitude measure (CAM). *Computers in Human Behaviour*, *9*, 371–386.

Kaye, A. (1992). Learning together apart. In A. R. Kaye (Ed.), *Collaborative Learning Through Computer Conferencing* (pp. 1–24). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-77684-7_1

Kazi Enamul, H., Ahmad Zabidi, A. R., & Mosa, M. F. (2012). ICT utilization among school teachers and principals in Malaysia. *International Journal of Academic Research in Progressive Education and Development*, *1*(4), 17–34.

Kearsley, G., & Lynch, W. (1994). *Educational technology: Leadership perspective*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Kelloway, K.E., Barling, J., Kelley, E., Comtois, J., & Gatien, B. (2003). Remote transformational leadership. *Leadership & Organization Development Journal*, *24*(3), 163–171. https://doi.org/10.1108/01437730310469589

Khawaj, M. (2009). E-leadership: The emerging new leadership for the virtual organization. *Journal of Managerial Sciences*, *3*(1), 1–21.

Kim, S. (2011). *The relationship between principal leadership and teacher attitudes evidence from the Schools and Staffing Survey* (Master's Thesis). Georgetown University, Washington, DC.

Kim, Y., & Crowston, K. (2011). Technology adoption and use theory review for studying scientists' continued use of cyber-infrastructure. In *Proceedings of the American Society for Information Science and Technology* (Vol. 48, pp. 1–10). New Orleans, LA, USA.

Kollias, V., Mamalougos, N., Vamvakoussi, X., Lakkala, M., & Vosniadou, S. (2005). Teachers' attitudes to and beliefs about web-based Collaborative Learning Environments in the context of an international implementation. *Computers & Education*, *45*(3), 295–315. https://doi.org/10.1016/j.compedu.2005.04.012

Korte, W.B, & Husing, T. (2015). E-Leadership: Digital skills for SMEs. European Communities.

Korte, W. B., & Hüsing, T. (2006). Benchmarking access and use of ICT in European schools 2006: Results from Head Teacher and A Classroom Teacher Surveys in 27 European countries. Empirica. Retrieved from ftp://ftp.uwc.ac.za/users/DMS/CITI/New%20PHd%20folder/m-icte2006/Benchmarking%20Access.pdf

Koszalka, T. A. (2001). Effect of computer-mediated communications on teachers' attitudes toward using web resources in the classroom. *Journal of Instructional Psychology*, *28*(2), 95-103.

Kotter, J. P. (2012). *Leading change*. Boston, Massachusetts: Harvard Business Review Press.

Kroonenberg, N. (1994). Developing communicative and thinking skills via electronic mail. *TESOL Journal*, *4*(2), 24–27.

Kursunoglu, A., & Tanrıogen, A. (2009). The relationship between teachers' perceptions towards instructional leadership behaviours of their principals and teachers' attitudes towards change. *Procedia - Social and Behavioural Sciences*, *1*(1), 252–258. https://doi.org/10.1016/j.sbspro.2009.01.046

Kusano, K., Frederiksen, S., Jones, L., Kobayashi, M., Mukoyama, Y., Yamagishi, T., … Ishizuka, H. (2013). The effects of ICT environment on teachers' attitudes and technology integration in Japan and the US. *Journal of Information Technology Education*, *12*(1), 29–43.

Lackney, J. A. (2005). New approaches for school design. In W. Fenwick (Ed.), *The sage handbook of educational leadership: Advances in theory, research, and practices*. Thousand Oaks, California: Sage Publications, Inc.

Lai, C. S., & Yin, C. C. (1997). Perceptions of women principals' leadership and teachers' work attitudes. *Journal of Educational Administration*, *35*(2), 165–184. https://doi.org/10.1108/09578239710161786

Lam, P. H.-C., & Woodhead, P. (2012). A critical analysis of the challenges facing e-leaders in the 21st century: A review and comparison of the information and communication technology development of a public school and a public independent school in Hong Kong. *International Journal of Learning*, *18*(3), 131–145.

Lau, S.-H., & Woods, P. C. (2008). An investigation of user perceptions and attitudes towards learning objects. *British Journal of Educational Technology*, *39*(4), 685–699. https://doi.org/10.1111/j.1467-8535.2007.00770.x

Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform: Effects on students, teachers, and their classroom practices. *School Effectiveness and School Improvement*, *17*(2), 201–227. https://doi.org/10.1080/09243450600565829

Leithwood, K., Louis, K.S., Anderson, S. & Wahlstrom, K. (2004). How leadership influences student learning: A review of research for the Learning from Leadership project. New York: The Wallace Foundation.

Lennon, R., Rentfro, R. W., & Curran, J. M. (2012). Exploring relationships between demographic variables and social networking use. *Journal of Management and Marketing Research*, *11*, 1–16.

Leonard, L. J., & Leonard, P. E. (2006). Leadership for technology integration: Computing the reality. *The Alberta Journal of Educational Research*, *52*(4), 212–224.

Leong, M. W. (2017). Principal technology leadership practices, teacher ICT competency and teacher acceptance of school management system (SMS) in the Negeri Sembilan secondary schools. (Degree of Doctor in Philosophy). University of Malaya, Malaysia.

Leong, M.W., Chua, Y. P., Kannan, S., & Shafinaz, A.M. (2016). Principal Technology Leadership Practices and Teacher Acceptance of School Management System (SMS). *Jurnal Pemimpin*, *11*(1), 89–102.

Li, N. (2002). *Culture and gender aspects of students information searching behaviour using the Internet: A two-culture study of China and the United Kingdom* (Degree of Doctor in Philosophy). Open University, United Kingdom.

Li, N., & Kirkup, G. (2007). Gender and cultural differences in Internet use: A study of China and the UK. *Computers & Education*, *48*(2), 301–317. https://doi.org/10.1016/j.compedu.2005.01.007

Liaw, S.-S. (2002). An Internet survey for perceptions of computers and the World Wide Web: relationship, prediction, and difference. *Computers in Human Behaviour*, *18*(1), 17–35. https://doi.org/10.1016/S0747-5632(01)00032-2

Liaw, S.-S., & Huang, H.-M. (2003). An investigation of user attitudes toward search engines as an information retrieval tool. *Computers in Human Behaviour*, *19*(6), 751–765. https://doi.org/10.1016/S0747-5632(03)00009-8

Liaw, S.-S., Huang, H.-M., & Chen, G.-D. (2007). Surveying instructor and learner attitudes toward e-learning. *Computers & Education*, *49*(4), 1066–1080. https://doi.org/10.1016/j.compedu.2006.01.001

Lieberman, A. (1996). Creating Intentional Learning Communities. *Educational Leadership*, *54*(3), 51–55.

Lim, C. P., Zhao, Y., Tondeur, J., Chai, C. S., & Tsai, C.-C. (2013). Bridging the gap: Technology trends and use of technology in schools. *Educational Technology & Society*, *16*(2), 59–68.

Ling, S. L. M., & Mohammed Sani, I. (2013). Transformational leadership and teacher commitment in secondary schools of Sarawak. *International Journal of Independent Research and Studies*, *2*(2), 51–65.

Longsworth, L. M. (2010). *Leadership in the virtual higher education environment: Towards an appropriate model and framework* (Degree of Doctor in Philosophy). University of Bath, United Kingdom. Retrieved from http://opus.bath.ac.uk/23121/

Lord, R. G., & Brown, D. J. (2001). Leadership, values, and subordinate self-concepts. *The Leadership Quarterly*, *12*(2), 133–152.

Lovelace, K. J. (2015). *A Case Study of E-Leadership Constructs: An Assessment of Leadership in a Healthcare Organization* (Degree of Doctor in Philosophy). The University of San Francisco, San Francisco. Retrieved from http://repository.usfca.edu/diss/294/

Lu, J., Yu, C.-S., Liu, C., & Yao, J. E. (2003). Technology acceptance model for wireless Internet. *Internet Research, 13*(3), 206–222.

Luszczynska, A., & Schwarzer, R. (2007). Social cognitive theory. In M. Conner & P. Norman (Eds.), *Predicting health behaviour: Research and practice with social cognition models* (Second ed). Maidenhead: Open University Press.

Malay Mail Online. (2014). Education Ministry defends 1Bestarinet targeted in A-G's Report. Retrieved from http://www.spotnews.co/malaysia news/5460b3127a13e1b532de79ed

Maslowski, R. (2001). *School culture and school performance: An explorative study into the organizational culture of secondary schools and their effects*. University of Twente, Netherlands.

Mazer, J. P., Murphy, R. E., & Simonds, C. J. (2007). I'll see you on "facebook": The effects of computer-mediated teacher self-disclosure on student motivation, affective learning, and classroom climate. *Communication Education*, *56*(1), 1–17. https://doi.org/10.1080/03634520601009710

McCarthy, P. J. (1998). *Teacher attitudes toward computers and the relationship between attitudes toward computers and level of involvement with computers among New York special education teachers.* (Degree of Doctor in Philosophy). Columbia University, New York, US.

McCarthy, R. (2012). Malaysia education policy review: A systems-approach to education reform. Retrieved from http://www.unescobkk.org/education/news/article/malaysia-education-policy-review-a-systems-approach-to-education-reform/

McFarland, D. J., & Hamilton, D. (2006). Adding contextual specificity to the technology acceptance model. *Computers in Human Behaviour*, *22*(3), 427–447. https://doi.org/10.1016/j.chb.2004.09.009

Mees, G.W. (2008). *The Relationships Among Principal Leadership, School Culture, and Student Achievement in Missouri Middle Schools* (Degree of Doctor in Philosophy). University of Missouri, Columbia.

Merriam-Webster. (2016). Definition of characteristic. Retrieved from http://www.merriam-webster.com/dictionary/characteristic

Ministry of Education. (2012b). *Interim Strategic Plan 2011-2020.* Putrajaya.

Ministry of Education. (2012). *Malaysia Education blueprint 2013-2025 (Preschool to Post-Secondary Education).* Putrajaya: Ministry of Education.

Ministry of Finance. (2014). Feedback on The Auditor General's Report, Series 3. Putrajaya: Ministry of Finance.

Mirzajani, H., Delaviz Bayekolaei, M., Rajaby Kookandeh, M., Rezaee, R., Safoora, S., Kamalifar, A. A., & Razaghi Shani, H. (2016). Smart schools an innovation in education: Malaysian's experience. *Asian Journal of Education and Training*, *2*(1), 11–15.

Mishra, P., Henriksen, D., Boltz, L. O., & Richardson, C. (2016). E-leadership and teacher development using ICT. In R. Huang, Kinshuk, & J. K. Price (Eds.), *ICT in Education in Global Context* (pp. 249–266). Berlin, Heidelberg: Springer Berlin Heidelberg.

Mohamad Ali, Y. (2015). *Peningkatan prestasi penulisan karangan Bahasa Melayu dengan penggunaan Frog VLE (Frog Virtual Learning Environment)* (Master Pendidikan PBMP). Universiti Putra Malaysia, Malaysia.

Mohammed I, I. (2003). *Relationships of selected factors and the level of computer use for instructional purposes by technology education teachers in Ohio public schools: A statewide survey* (Degree of Doctor in Philosophy). The Ohio State University, Ohio, United States.

Mohammed Sani, I., Ahmad Zabidi, A., & Husaina Banu, K. (2013). Smart principals and smart schools. *Procedia - Social and Behavioural Sciences*, *103*, 826–836. https://doi.org/10.1016/j.sbspro.2013.10.404

Mohd Yusri, I. (2014). Model of E-Leadership, Intra-team Communication and Job Satisfaction among School Leaders in Malaysia. *Mediterranean Journal of Social Sciences*, *5*(23), 1927–1931. https://doi.org/10.5901/mjss.2014.v5n23p1927

Mohd Yusri, I. (2015). Model of Virtual Leadership, Intra-team Communication and Job Performance Among School Leaders in Malaysia. *Procedia - Social and Behavioural Sciences*, *186*, 674–680. https://doi.org/10.1016/j.sbspro.2015.04.126

Mojgan, A., Kamariah, A. B., Wong, S. L., Bahaman, A. S., & Foo, S. F. (2009). Factors affecting teachers' use of information and communication technology. *Online Submission*, *2*(1), 77–104.

Moyle, K. (2010). *Building innovation: Learning with technologies* (Australian education review). Australian Council for Educational Research. Retrieved from http://research.acer.edu.au/aer/10/

Muijs, D. (2011). *Doing quantitative research in education with SPSS* (2nd ed.). London, England: Sage Publications.

Muijs, D. (2012). Surveys and Sampling. In *Research methods in educational leadership and management* (Briggs, A. R., Coleman, M. & Morrison, M., (Ed), pp. 141–154). London, England: Sage Publications.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education*, *9*(3), 319–342.

Mwawasi, F. M. (2014). Technology leadership and ICT use: Strategies for capacity building for ICT integration. *Journal of Learning for Development - JL4D*, *1*(2), 1-7.

Nabeel, A., Shahrir, J., & Chin, H. L. (2013). Measuring attitudes toward computer and Internet usage among postgraduate students in Malaysia. *TOJET: The Turkish Online Journal of Educational Technology*, *12*(2), 200–216. National Audit Department. (2014). *Auditor General's Report for the Year 2013: Series 3.* Malaysia: National Audit Department.

New Straits Times. (2014). DPM: Plans to meet our future needs. Retrieved from http://www.frogasia.com/v3/dpm-plan-education-to-meet-our-future-needs/.

Ng, P. T. (2008). Developing forward-looking and innovative school leaders: The Singapore Leaders in Education Programme. *Professional Development in Education*, *34*(2), 237–255. https://doi.org/10.1080/13674580801951053

Ng, W. L. (2008). Transformational leadership and the integration of information and communications technology into teaching. *The Asia-Pacific Education Researcher*, *17*(1), 1–14.

Northouse, P.G. (2013). *Leadership: Theory and practices* (6 ed.). Thousand Oaks, CA: Sage Publications, Inc.

Nsofor, C. C., Umeh, A. E., Ahmed, B., & Sani, I. D. (2014). Blended learning environment: An innovative pedagogical approach for redefining higher education in Nigeria. *Research on Humanities and Social Sciences*, *4*(26), 21–27.

Nurul Farhana, J. (2013). *Cabaran dalam mengimplementasi virtual learning Environment (VLE) frog dalam pengajaran dan pembelajaran oleh guru di sekolah-sekolah di Malaysia.* Universisi Teknologi Malaysia, Malaysia.

Ocak, M. A., & Akdemir, O. (2008). An investigation of primary school science teachers' use of computer applications. *TOJET: The Turkish Online Journal of Educational Technology*, *7*(4), 54–60.

Ofsted Survey. (2009). *Virtual learning environments: An evaluation of their development in a sample of educational setting.* Retrieved from http://dera.ioe.ac.uk/325/1/VLE%20an%20evaluation%20of%20their%20development.pdf.

Omoogun, A.C., Ephraim, P. E., & Omoogun, R. (2013). Impediments to the adoption of information and communication technology (ICT) in teacher preparation programme. *International Journal of Education*, *5*(3), 11–19. https://doi.org/10.5296/ije.v5i3.4006

Orr, L.H. (1990). *The impact of demographic variables on teachers perceptions of the effectiveness of female elementary principals* (Degree of Doctor of Education). Clark Atlanta University, Georgia.

Ostrom, T.M. (1969). The relationship between the affective, behavioural, and cognitive components of attitude. *Journal of Experimental Social Psychology*, *5*(1), 12–30. https://doi.org/10.1016/0022-1031(69)90003-1

Ottestad, G. (2013). School leadership for ICT and teachers' use of digital tools. *Nordic Journal of Digital Literacy*, *8*(1–2), 107–125.

Oxford advanced learner's dictionary. (2016). Retrieved from http://www.oxfordlearnersdictionaries.com/definition/english/attitude?q=attitude

Park, A., & Popescu, L. (2014). *E-leadership for project managers: Virtual leadership and trust-building for perceived project success* (Master's Thesis). Jonkoping University, Sweden.

Pepitone, A. (1994). Beliefs and Cultural Social Psychology. In *Cross-Cultural Topics in Psychology* (L.L. Adler and U.P. Gielen, pp. 139–152). Westport, CT: Praeger.

Politis, J. (2014). The effect of e-leadership on organisational trust and commitment of virtual teams. In *The 10th European Conference on Management, Leadership & Governance (ECMLH2014)* (pp. 254–261). University of Applied Science, Zagreb, Republic of Croatia.

Politis, J., & Politis, D. (2011). The big five personality traits and the art of virtual leadership. In *The 7th European Conference on Management, Leadership and Governance (ECMLH2011)* (pp. 342–349). SKEMA Business School, Sophia-Antipolis, France.

Porter, C. E., & Donthu, N. (2006). Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics. *Journal of Business Research*, *59*(9), 999–1007. https://doi.org/10.1016/j.jbusres.2006.06.003

Potosky, D., & Bobko, P. (2001). A model for predicting computer experience from attitudes toward computers. *Journal of Business and Psychology*, *15*(3), 391–404.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behaviour Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Preston, J. P., Jakubiec, B. A., Jones, J., Earl, R., Christensen, R., Kemp, S., … Poirier, A. (2014). Twitter and E-Leadership in a Postsecondary Setting (pp. 1–14). Presented at the Commonwealth Council for Educational Administration and Management (CCEAM) Conference, Fredericton, NB.

Pulley, M., L., & Sessa, V. I. (2001). E-leadership: Tackling complex challenges. *Industrial and Commercial Training*, *33*(6), 225–230. https://doi.org/10.1108/00197850110405379

Purvanova, R. K., & Bono, J. E. (2009). Transformational leadership in context: Face-to-face and virtual teams. *The Leadership Quarterly*, *20*(3), 343–357. https://doi.org/10.1016/j.leaqua.2009.03.004

Pynoo, B., Devolder, P., Tondeur, J., van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behaviour*, *27*(1), 568–575. https://doi.org/10.1016/j.chb.2010.10.005

Qteishat, M. K. (2014). Factors influencing the adoption of e-leader: An empirical field study of jordanian banks. *International Journal of Human Resource Studies*, *4*(3), 228. https://doi.org/10.5296/ijhrs.v4i3.6198

Reeves, D. B. (2004). Evaluating administrators. *Educational Leadership*, *61*(7), 52–59.

Robertson, S. L. (2005). Re-imagining and rescripting the future of education: global knowledge economy discourses and the challenge to education systems. *Comparative Education*, *41*(2), 151–170. https://doi.org/10.1080/03050060500150922

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed). New York: The Free Press.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed). New York: Free Press.

Ropp, M. M. (1999). Exploring individual characteristics associated with learning to use computers in preservice teacher preparation. *Journal of Research on Computing in Education*, *31*(4), 402–424. https://doi.org/10.1080/08886504.1999.10782262

Rosenberg, M. J. (1960). Cognitive, affective, and behavioural components of attitudes. In M. J. Rosenberg, C. I. Hovland, W. J. McGuire, R. P. Abelson, & J. W. Brehm, *Attitude organization and change: An analysis of consistency among attitude components*. New Haven, CT: Yale University Press.

Rosnaini, M., & Mohd Arif Hj, I. (2010). Impact of training and experience in using ICT on in-service teachers' basic ICT literacy. *Malaysian Journal of Educational Technology*, *10*(2), 5–10.

Roussos, P. (2007). The Greek computer attitudes scale: Construction and assessment of psychometric properties. *Computers in Human Behaviour*, *23*(1), 578–590. https://doi.org/10.1016/j.chb.2004.10.027

Rovai, A. P., & Jordan, H. M. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. *International Review of Research in Open and Distance Learning*, *5*(2), 1-12.

Ruiz, D.M., Gremler, D.D., Washburn, J.H., & Carrion, G.C. (2010). Reframing customer value in a service-based paradigm: An evaluation of a formative measure in a multi-industry, cross-cultural context. In V.E. Vinzi, J. Henseler, W.W. Chin, & H.W. Wang (Eds.), *Handbook of partial least squares: Concepts, methods and applications*. Berlin, Heidelberg: Springer.

Sadik, A. (2006). Factors influencing teachers' attitudes toward personal use and school use of computers: New evidence from a developing nation. *Evaluation Review*, *30*(1), 86–113. https://doi.org/10.1177/0193841X05276688

Saltan, F. (2015). Development and Validation of Information Technology Mentor Teacher Attitude Scale: A Pilot Study. *Participatory Educational Research*, *2*(1), 79–90. https://doi.org/10.17275/per.15.04.2.1

Samuel, R.J., & Zaitun, A.B. (2007). Do teachers have adequate ICT resources and the right ICT skills in integrating ICT tools in the teaching and learning of English language in Malaysian schools? *The Electronic Journal of Information Systems in Developing Countries*, *29*(2), 1–15.

Schiller, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration*, *41*(2), 171–185. https://doi.org/10.1108/09578230310464675

Sekaran, U. (2003). *Research methods for business: A skill building approach* (4th ed.). New York, USA: John Wiley & Sons, Inc.

Shafinaz, A.M. (2016). *Hubungan antara kecerdasan emosi dan kepimpinan instruksional pengetua dengan efikasi kendiri guru sekolah menengah di Negeri Sembilan* (Degree of Doctor in Philosophy). University of Malaya, Malaysia.

Shareef, M. A., Kumar, V., Kumar, U., & Hasin, A. A. (2009). Theory of planned behaviour and reasoned action in predicting technology adoption behaviour. In Y. K. Dwivedi (Ed.), *Handbook of Research on Contemporary Theoretical Models in Information Systems* (pp. 544–562). US: IGI Global.

Shaughnessy, J. J., Zechmeister, E. B., & Zechmeister, J. S. (2012). *Research methods in psychology.* (9th ed.). Americas, New York: McGraw-Hill Companies, Inc.

Sherblom, J. C., Withers, L. A., & Leonard, L. G. (2013). The influence of computer-mediated communication (CMC) competence on computer-supported collaborative learning (CSCL) in online classroom discussions. *Human Communication*, *16*(1), 31–39.

Shouppe, G.A. (2005). *Teachers' perceptions of school climate, principal leadership style, and teacher behaviours on student academic achievement in select Georgia schools* (Degree of Doctor of Education). Valdosta State University, USA.

Simpson, M., Payne, F., & Condie, R. (2005). Introducing ICT in secondary schools a context for reflection on management and professional norms. *Educational Management Administration & Leadership*, *33*(3), 331–354. https://doi.org/10.1177/1741143205054013

Siti Faizzatul Aqmal, M. M., Razali, H., & Ahmad Fadzil, A. (2014). Amalgamation of Dale's Cone of Experience, Bloom's Taxonomyand 21st Century Skills Through Virtual Learning Environment. *Journal of ContempporaryManagement Sciences*, *4*(1), 88–99.

Sohawon, M. S., Panday, Y. D., & Baxou, A. K. (2015). Reviewing the management procedures from a down-up approach to integrate ICT in schools to enhance work: A case study at a model school in Mauritius. *International Journal of Educational Policy Research and Review*, *2*(8), 103–112.

Spitzberg, B.H. (2000). A model of intercultural communication competence. *Intercultural Communication: A Reader*, *9*, 379–391.

Spitzberg, B.H. (2006). Preliminary development of a model and measure of computer-mediated communication (CMC) competence. *Journal of Computer-Mediated Communication*, *11*(2), 629–666. https://doi.org/10.1111/j.1083-6101.2006.00030.x

Spitzberg, B.H. (2007). CSRS The conversational skills rating scale: An instructional assessment of interpersonal competence. In *NCA Diagnostic Series*. San Antonio, Texas.

Spitzberg, B.H. (2011). The interactive media package for assessment of communication and critical thinking (IMPACCT): Testing a programmatic online communication competence assessment system. *Communication Education*, *60*(2), 145–173. https://doi.org/10.1080/03634523.2010.518619

Spitzberg, B.H., & Cupach, W. (1984). *Interpersonal communication competence.* Beverly Hills, CA: Sage.

Spitzberg, B.H. (2003). Methods of interpersonal skills assessment. In J. O. Greene & B. R. Burleson (Eds.), *Handbook of communication and social interaction skills* (pp. 93–134). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Spring, J. (2008). Research on Globalization and Education. *Review of Educational Research*, *78*(2), 330–363. https://doi.org/10.3102/0034654308317846

Stevens, S. S. (1946). On the theory of scales of measurement. *Science*, *103*(2684), 677–680.

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research*, *79*(2), 625–649. https://doi.org/10.3102/0034654308325896

Sujo-Montes, L., & Gallagher, L. (2011). School, technology and society: Home-school communication and access. In R. Papa (Ed.), *Technology leadership for school improvement*. Thousand Oaks, California: Sage Publications, Inc.

Tabachnick, B.G., & Fidell, L.S. (2012). *Using multivariate statistics* (6th ed.). USA: Pearson.

Tahir, L.M., Rahman, M. A.A., Yassin, M.A.-M., & Ling, P.I. (2010). Primary school teachers' perception towards head teachers' role as an ICT leader. *Journal of Educators & Education*, *25*, 169–188.

Tan, S. C. (2010). School technology leadership: Lessons from empirical research. In C. H. Steel, M. J. Keppell, P. Gerbic, & S. Housego (Eds.), *Proceedings of the Ascilite Conference* (pp. 896–906). Sydney. Retrieved from http://repository.nie.edu.sg/handle/10497/4622

Taras, V., Kirkman, B.I., & Steel, P. (2010). Examining the impact of Culture's consequences: A three-decade, multilevel, meta-analytic review of Hofstede's cultural value dimensions. *Journal of Applied Psychology*, *95*(3), 405–439. https://doi.org/http://dx.doi.org/10.1037/a0018938

Teo, T. (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology*, *24*(4), 413–424.

Teo, T. (2009). Is there an attitude problem? Reconsidering the role of attitude in the TAM. *British Journal of Educational Technology*, *40*(6), 1139–1141. https://doi.org/10.1111/j.1467-8535.2008.00913.x

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computer & Science*, *57*, 2432–2440.

Teo, T. (2015). Comparing pre-service and in-service teachers' acceptance of technology: Assessment of measurement invariance and latent mean differences. *Computers & Education*, *83*, 22–31. https://doi.org/10.1016/j.compedu.2014.11.015

Tezci, E. (2010). Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers. *Journal of Human Sciences*, *7*(2), 19–44.

Tezci, E. (2011). Turkish primary school teachers' perceptions of school culture regarding ICT integration. *Educational Technology Research and Development*, *59*(3), 429–443. https://doi.org/10.1007/s11423-011-9205-6

The Economic Planning Unit of Prime Minister's Department. (2010). *Tenth Malaysia Plan 2011-2015*. Putrajaya: The Economic Planning Unit of Prime Minister's Department.

The Organisation for Economic Co-operation and Development (OECD). (1996). *The knowledge based economy*. Paris: OECD. Retrieved from https://www.basicknowledge101.com/pdf/KNOWLEDGE-BASED%20ECONOMY.pdf

Tondeur, J., Devos, G., Houtte, M. V., Braak, J. van, & Valcke, M. (2009). Understanding structural and cultural school characteristics in relation to educational change: the case of ICT integration. *Educational Studies*, *35*(2), 223–235. https://doi.org/10.1080/03055690902804349

Truong, T. D., Hallinger, P., & Sanga, K. (2017). Confucian values and school leadership in Vietnam: Exploring the influence of culture on principal decision making. *Educational Management Administration & Leadership*, *45*(1), 77–100. https://doi.org/10.1177/1741143215607877

van Braak, J. (2001). Factors influencing the use of computer mediated communication by teachers in secondary schools. *Computers & Education*, *36*(1), 41–57.

van Braak, J., Tondeur, J., & Valcke, M. (2004). Explaining different types of computer use among primary school teachers. *European Journal of Psychology of Education*, *19*(4), 407–422. https://doi.org/10.1007/BF03173218

Van Niekerk, M. P. (2009). *Principals' influences on teacher professional development for the integration of information and communication technologies in schools* (Degree of Doctor in Philosophy). University of Pretoria, South Africa.

Vázquez Cano, E. (2013). Open government and e-leadership in schools mediated by ICT. *Croatian Journal of Education*, *15*(1), 11–41.

Venkatesh, V., & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204.

Venkatesh, V., Davis, F. D., & Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of the Association for Information Systems*, *8*(4), 267–286.

Voogt, J. (2010). Teacher factors associated with innovative curriculum goals and pedagogical practices: differences between extensive and non-extensive ICT-using science teachers: ICT-using science teachers. *Journal of Computer Assisted Learning*, *26*(6), 453–464. https://doi.org/10.1111/j.1365-2729.2010.00373.x

Walther, J.B. (1995). Relational aspects of computer-mediated communication: Experimental observations over time. *Organization Science*, *6*, 186–203.

Wang, L.H., Gurr, D., & Drysdale, L. (2016). Successful school leadership: Case studies of four Singapore primary schools. *Journal of Educational Administration*, *54*(3), 270–287. https://doi.org/10.1108/JEA-03-2015-0022

Wang, Y.-S. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management*, *41*(1), 75–86. https://doi.org/10.1016/S0378-7206(03)00028-4

Wanlabeh, N. (2011). *The relationship between principals' transformational leadership practices and teachers' motivation in selected islamic private schools in Songkhla, Southern Thailand.* (Master of Education). International Islamic University Malaysia, Malaysia.

Warschauer, M. (1997). Computer-mediated collaborative learning: Theory and practice. *Modern Language Journal*, *81*(3), 470–481.

Watson, G. (1999). Barriers to the integration of the Internet into teaching and learning: Professional development. Presented at the Asia Pacific Regional Internet Conference on Operational Technologies, Singapore.

Waxman, H.C., Boriack, A. W., Lee, Y.-H., & MacNeil, A. (2013). Principals' perceptions of the importance of technology in schools. *Contemporary Educational Technology*, *4*(3), 187–196.

Williams, C.J. (2015). An investigation of K-12 teachers' attitudes toward computer technology use in schools. *Journal of Business & Economic Policy*, *2*(1), 71–87.

Wong, K.K. (2016). Mediation analysis, categorical moderation analysis, and higher-order constructs modeling in Partial Least Squares Structural Equation Modeling (PLS-SEM): A B2B Example using SmartPLS. *The Marketing Bulletin*, *26*, 1–22.

Wong, S.L., & Atan, H. (2007). Gender differences in attitudes towards information technology among malaysian student teachers: A case study at universiti putra Malaysia. *Educational Technology & Society*, *10*(2), 158–169.

Woodrow, J. E. J. (1992). The influence of programming training on the computer literacy and attitudes of preservice teachers. *Journal of Research on Computing in Education*, *25*(2), 200–219. https://doi.org/10.1080/08886504.1992.10782044

Wu, H., Gao, J., & Zhang, W. (2014). Chinese EFL teachers' social interaction and socio-cognitive presence in synchronous computer-mediated communication. *Language Learning & Technology*, *18*(3), 228–254.

Yang, H., & Yoo, Y. (2004). It's all about attitude: Revisiting the technology acceptance model. *Decision Support Systems*, *38*(1), 19–31. https://doi.org/10.1016/S0167-9236(03)00062-9

Yee, D. L. (2000). Images of school principals' information and communications technology leadership. *Journal of Information Techology for Teacher Education*, *9*(3), 287–302. https://doi.org/10.1080/14759390000200097

Yildirim, S. (2000). Effects of an educational computing course on preservice and inservice teachers. *Journal of Research on Computing in Education*, *32*(4), 479–495. https://doi.org/10.1080/08886504.2000.10782293

Yuen, A. H. K., Law, N., & Wong, K. C. (2003). ICT implementation and school leadership: Case studies of ICT integration in teaching and learning. *Journal of Educational Administration*, *41*(2), 158–170. https://doi.org/10.1108/09578230310464666

Yunus, M. M. (2007). Malaysian ESL Teachers' Use of ICT in Their Classrooms: Expectations and Realities. *ReCALL*, *19*(1), 79–95. https://doi.org/10.1017/S0958344007000614

Zaccaro, S. J., & Bader, P. (2003). E-leadership and the challenges of leading e-teams: Minimizing the bad and maximizing the good. *Organizational Dynamics*, *31*(4), 377–387.

Zain, M. Z.M., Atan, H., & Idrus, R. M. (2004). The impact of information and communication technology (ICT) on the management practices of Malaysian Smart Schools. *International Journal of Educational Development*, *24*(2), 201–211. https://doi.org/10.1016/j.ijedudev.2003.10.010

Zainudin Awang. (2014). *A Handbook on Structural Equation Modeling*. Selangor, Malaysia: MPWS Rich Resources.

Zhou, Q., Hu, J., & Gao, S. (2010). Chemistry teachers' attitude towards ICT in Xi'an. *Procedia - Social and Behavioural Sciences*, *2*(2), 4629–4637. https://doi.org/10.1016/j.sbspro.2010.03.741

Zimbardo, P., Ebbesen, E. B., & Maslach, C. (1977). *Influencing attitudes and changing behaviour* (2nd ed.). Philippines: Addison-Wesley Publishing Company.

Zlatić, L., Bjekić, D., Marinković, S., & Bojović, M. (2014). Development of Teacher Communication Competence. *Procedia - Social and Behavioural Sciences*, *116*, 606–610. https://doi.org/10.1016/j.sbspro.2014.01.265

LIST OF PUBLICATIONS AND PAPER PRESENTED

Oh, S. P., & Chua, Y. P. (2016). Principal e-leadership practices and teacher attitude toward using the Frog VLE. *Jurnal Pemimpin*, *12*, 147–170.

Oh, S. P., & Chua, Y. P. (2017). An explorative review of e-leadership studies. *International Online Journal of Educational Leadership, 1(2),* 3–33.